JUL 21 1943

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Contractors and Engineers Monthly

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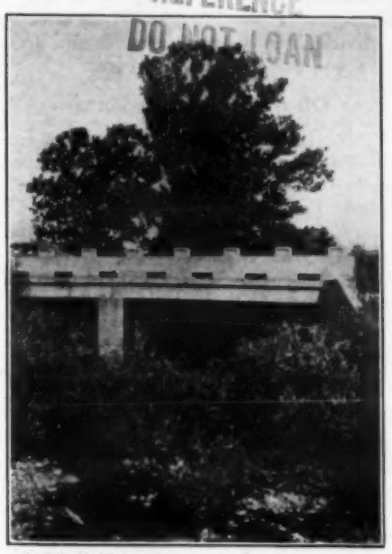
REFERENCE DO NOT LOAN

Highlights Of This Issue

- **Water for War Industries**
  The expansion of war industries and the attendent sudden rise in civilian water use in the Hampton Roads, Va., area, necessitated a speedy increase in its water-supply facilities. The program for enlarging the water supply and the ingenious design of the project to minimize the use of critical materials are described in this issue. See page 1.
- **Post-War Planning**
  Continuing our series of articles on planning for various phases of post-war construction, this issue discusses the needs and plans for flood control, irrigation, new pipe lines, the expansion of utilities, and hydro power in the post-war era. See page 2.
- **Airport Construction**
  Hot-mix paving of an Army Air Base runways and the plants which produced the surfacing material are described in this issue, which also contains an article discussing some of the problems encountered in constructing an airfield in British Columbia. See pages 2 and 16.
- **Maintenance by Contract**
  The problem of adequate highway maintenance, in the face of depleted personnel and restricted equipment purchases, grows more serious each month. A contractor's suggestion for easing the burden on the highway department staff is enlisting the aid of contractors, their remaining personnel and equipment, under a maintenance-by-contract program. See page 7.
- **Speedy Concreting for Army**
  Well-planned batching and truck mixers speeded up concreting for the warehouses and other structures at a large Chemical Warfare Service plant, while the contractor for paving the heavy hauling roads at an Army Depot, surmounting many obstacles, maintained a rapid production rate with two 27-E pavers. See pages 9 and 36.
- **Timber Bridges**
  The use of timber superstructures for short-span bridges in New Hampshire, to avoid the use of critical materials, has worked out very successfully and economically. See page 15.

IN THIS ISSUE

Aggregate Production	2
Airport Construction	2, 16
Bituminous Roads	10, 25
Bridges	1, 15
Care of Equipment	42, 49, 52
Cartoons	4
Concrete Construction	9, 36
Country Road Work	1
Editorials	4
Highway Maintenance	6, 7, 21
Highway Shops	42
Post-War Planning	2, 20, 53, 60
Roadside Development	6, 21, 41
Safety	55
Testing	32, 33
Wartime Rulings	17, 31, 45
Water Supply Project	1



C. & E. M. Photo
A Cole County bridge built with unit steel forms.

Good Gravel Roads Free of Washboard

Cole County, Mo., Keeps 300 Miles of Dirt Roads In Good Condition; Novel Unit Steel Bridge Forms

(*Photo on page 64*)

✦ WHEN one interviews a County Engineer and learns that the county has an area of about 389 square miles, with only 312 miles of county highways and those all gravel, and that the county road and bridge tax is only $12,000 a year, the less hardy interviewing Editor

(*Continued on page 26*)

Greater Water Needs Supplied by a Huge Construction Program

Cities of Hampton Roads Area, Aided by Federal Funds, Expand Supplies Three Hundred Per Cent

✦ BEGINNING in 1940, the cities in the Hampton Roads area of Virginia began planning the expansion of their water-supply facilities to meet the demands of Army and Navy personnel stationed within the cities and in nearby camps. Thus began one of the speediest construction programs in the water-supply field, with design, construction and priorities problems running a race in which first one and then the other forged to the front.

Newport News, Norfolk, and Portsmouth have each taken part in this race to reach farther and farther afield for water to supply the increasing domestic, manufacturing, and camp demands. The cities started to finance the expansions from their own funds; then, under the Lanham Act of 1941, with loans and grants from Defense Public Works of the Federal Works Agency. Later work has been financed completely with Federal funds because the service required was due entirely to war activities.

Initial Expansion

In November, 1941, Newport News began the construction of a 6,000,000-gallon-daily (6-mgd) filter plant and the laying of 17 miles of cast iron mains at a cost of about $1,000,000, with the city paying 30 per cent of the total cost and securing a grant for the balance. This extension was designed to develop completely the existing supply. The city had three reservoirs, water being pumped over the divides from the two side reservoirs to the center one and there filtered and pumped to the city. This method resulted in considerable loss of water. It was decided to erect a filter plant on the larger of the side reservoirs at Harwoods Mill, and pump directly to the far end of the L-shaped distribution system serving the city and adjacent military areas, thus boosting the pressures where they were low. This development enabled the Newport News system to produce from 8 to 10 mgd, depending upon the amount of rainfall.

During this same period the city of Norfolk started the Burnt Mills Reservoir, and the construction of a number of other facilities. This program, costing about $2,500,000, was aided by a Federal grant of $1,080,150. The program included an earth dam and concrete spillway at Lake Burnt Mills; a pipe line from Lake Prince, Norfolk's chief source of water at that time, to Norfolk; a filtration plant in Norfolk and additions to the city's distribution system. The additional source of supply at Lake Burnt Mills is being made available by a tunnel from Lake Burnt Mills to Lake Prince. The latter will in the future be used for intermediate storage as well as a source of supply for Norfolk. A 36-inch Lock Joint concrete-pipe line has been constructed from Lake Prince to the main pumping station in Norfolk, paralleling the old supply line. In addition, a new 12-mgd filtration-plant extension at Norfolk doubled the capacity of the existing plant, and an additional 30-inch Lock Joint concrete pipe several miles long was laid from Moore's Bridge to the city, further to strengthen the supply and increase pressures.

These projects of both cities were outgrown before construction was fairly started. In the second month of construction of the Harwoods Mill project, the Newport News Shipbuilding Co. announced plans to increase the number of employees from 21,000 to 35,000, requiring a further extension of the Newport News water supply to provide 15 mgd.

Newsom & Aldrich, Engineer-Consultants of New York City and Williamsburg, Va., who had been engaged by the Newport News Waterworks Commission, were employed to investigate underground supplies along the James River between Smithfield and Surry. The wa-

(*Continued on page 12*)

NO NEW EQUIPMENT—SO MAKE YOURS LAST

C. & E. M. Photo
The machine-shop section of the State Highway Department shops at Phoenix, Arizona, where highway equipment is maintained and many useful devices are home-made. See page 42.

Post-War Construction

Flood Control and Irrigation Needs; Pipe Lines, Utilities and Hydro Power

Government Bureaus Plan Programs to Reduce Flood Danger, and to Produce More Food by Wider Irrigation

✦ FLOOD control and irrigation are major peacetime activities of two of our Federal departments, the Corps of Engineers of the War Department, and the Bureau of Reclamation of the Department of the Interior. The one protects life and property from too much water and the other protects life by storing water in sufficient quantities in arid regions to insure full food crops. Both are now engaged in extensive planning for post-war construction to insure a continuity of their activities for the protection of life and property, which will aid much in providing construction activities in the post-war era.

Speaking before the Eleventh Annual Convention of the National Reclamation Association at Denver, Colo., Major General Eugene Reybold, Chief of Engineers, U. S. Army, appropriately expressed the interrelationship of the problems of water use and control, which are now the basis of post-war designing by these Government agencies, "The advantages of cheap waterborne transportation can be extended up our large rivers and their tributaries by a combination of dams that will provide irrigation, flood control, and power—at the same place in many instances. River basins can be connected by suitable canals, in the manner which already has proved so successful on the European Continent and the British Isles. Rainfall on its way to the oceans in our rivers, large and small, can be used over and over again. The waters which contribute to destructive floods can be dammed and then released to generate power that will operate pumps to put the same water into irrigation channels further downstream."

Flood Control

For the decade before the present war a vast program of construction was carried on in the Mississippi Valley, centered about the Jadwin Plan. This work involved river cut-offs, new levees and raising old concrete flood walls, floodways and spillways, most of which was done by contract under the jurisdiction of the U. S. Engineer Department. Many of our troublesome rivers have been curbed in their mad flood careers by various control devices, much to the benefit of agricultural and grazing lands as well as industrial centers.

As the demands of war production increased, the program was pared to absolute necessity, but the paucity of protection from spring floods in Ohio, Illinois, Indiana, Arkansas, Kansas, Missouri, and Oklahoma was shown by the devastation of the mid-May rampage of the Illinois, Ohio, Missouri, Wabash, Arkansas, and White rivers.

Caterpillar Photo
Fighting the 1943 spring floods which disrupted war production in Peoria, Ill.

Seeming to defy the deferred program of controls planned by the Army Engineers, high water did over $1,000,000 damage to highways in Ohio, flooded 1,356,960 acres of farm lands, greatly reducing food supply, made more than 100,000 people homeless, engulfed the important railroad yards at Dupo, Ill., and washed out the main line of the Gulf, Mobile & Ohio Railroad, delaying

(*Continued on page 18*)

Pipe Lines Like "Big Inch", Gas and Electric Utilities, And TVA; Their Place in Post-War Economy

✦ MUCH has been said by construction men in our hearing of the great potential volume of construction expected in gas and oil pipe lines, by gas and electric utilities, and by the Tennessee Valley Authority in the post-war years. In order that our readers may understand the relationships of developments in these fields, we have interviewed numerous individuals in the various fields and here give you the composite picture.

Oil and Gas Pipe Lines

"Big Inch" has been good copy for the newspapers and for the technical press on the methods and remarkable speed of construction. The economics of pipe lines have not been discussed outside the trade papers of the petroleum industry, so that newspaper-heralded savings have led many contractors to believe that there will be a network of oil transmission lines laid after the war to move crude oil and its derivatives from the southwest to the northeast.

The story of the 24-inch pipe line from Longview, Texas, to Norris, Ill., a distance of 1,250 miles, built by thirteen contractors, has been a construction

(*Continued on page 34*)

C. & E. M. Photo
A rock crushing plant with no returns and no oversize used in Texas.

Dustless Rock Plant For Field Service

Roll Crusher, Rotary Screen and Hammermill for Oversize with No Returns Puts Out 90 Tons an Hour For Access Road Job

✦ AN assembled crushing and screening plant which produced 90 tons an hour of crushed rock of a maximum screen size of 2 inches and no returns and no oversize was operated by Colglazier & Hoff of San Antonio, Texas, to provide material for a flexible-base job on a military highway in Bexar County, Texas, using material from rock cuts within the right-of-way. The plant was operated on a production contract by the owner, with WPA loading the stone to be crushed and hauling away the finished product which had a plasticity index of 4 to 6, making it an excellent material for the 12-inch flexible base on this important highway.

The material from the rock cut was dumped into the feeding hopper which had no grizzly, but the two men at the hopper snaked out any overlarge rocks that could not be handled by the feeder. The material dropped directly onto a reciprocating apron feeder and thence to a 30-foot belt 30 inches wide which carried it to a McLanahan roll crusher. The crusher-run material was carried by a 52-foot belt 24 inches wide up to a rotary screen mounted on an old truck chassis for portability. The feeder belt, crusher, and delivery belt to the screen were driven by a Waukesha motor with a belt drive, and a second Waukesha, also with belt drive, operated the screen, bucket elevator, and pulverizer.

The material passing the rotary screen dropped onto a horizontal belt delivering it to the boot of a bucket elevator which carried it to the top of the loading bins. The oversize material rolled forward into the top of a Williams hammermill pulverizer set to deliver nothing over 2-inch screen size. The crushed material from the hammermill went directly to the bucket elevator, eliminating any return belts for rescreening.

The plant operated a full 8-hour day, producing 90 tons an hour regularly under the direction of J. D. Thornhill, Superintendent. The great advantage of this type of plant is not only the elimination of return belts through the positive sizing of the oversize material from the primary crusher in the hammermill, but the dustless character of the operation. The rotary screen was covered with a sheet-metal hood, making it look much like a covered wagon from a distance.

Air-Base Runways Paved with Asphalt

Two Plants Used to Supply Hot-Mix for Runways at All-Over Landing Field In Inter-Mountain Area

✦ AMONG the facilities of a new Air Base in the inter-mountain area are three runways, each 8,000 feet long, in the form of a triangle. The paved portion of these runways is 150 feet wide, with stabilized shoulders extending to a width of 500 feet. The area within the triangle is graded to a maximum of 2 per cent to provide an all-over landing field. The problems involved in the construction included stabilization of the base, proportioning materials for the asphaltic paving, and the surface treatment of the stabilized shoulders.

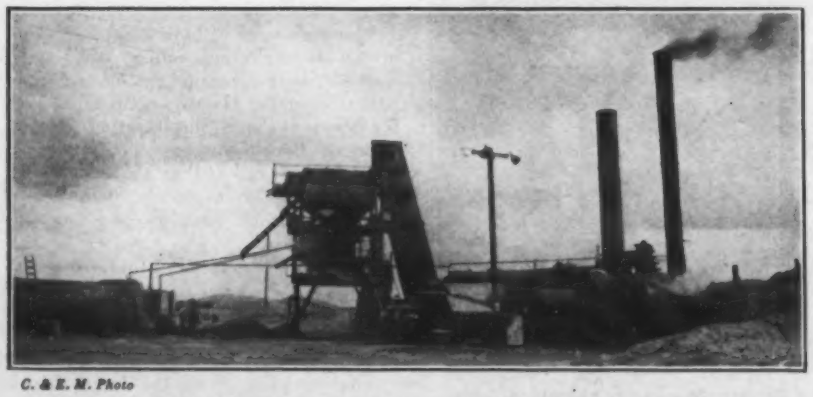
Preparation of Runway Base

The first operation in the preparation of the runway base was the stripping of the topsoil which was stockpiled for future use. As soon as it was determined that sufficient topsoil had been stored to meet the requirements, the practice of completely stripping fill areas was discontinued and only that material which would be detrimental to runway foundations was removed. The topsoil served a two-fold purpose in the construction: it was mixed with sand to provide stability and also to provide a surface for seeded areas. The sub-base for the runways and the runway shoulders was stabilized to optimum density for a depth of 12 inches by mixing topsoil and sand in the proportions required in the particular area. The amount of sand varied from 70 to 40 per cent. The water required was applied in the stockpiles by sprinklers, and the material was placed and rolled in layers not exceeding 5 inches in depth.

The nature of the soil was such that, if the optimum moisture as determined in the laboratory was used, rubbery spots developed. As it was impracticable to obtain as uniform a mixture in the fill as was possible in the laboratory, some areas contained more than optimum moisture, causing a rubbery condition. In order to correct this, the water content was dropped to slightly below optimum with no ill effects on the stability. Tests on the embankment laid in this manner revealed a density of between 98 and 100 per cent of optimum. The moisture content varied from 6 to 12 per cent, depending upon the location. To provide the water, it was necessary to install a pipe line 5 miles long with a pumping system consisting of a primary and booster pump.

The portion of the base section under the runways was given a tack coat of MC-1 oil, applied at the rate of 0.33 gallon per square yard. The stabilized shoulders of the first runway to be put into operation were also tacked in this manner for dust and erosion control. It was found that under these conditions the pilots had a tendency to use these shoulders as taxi strips. In spite of stabilization and tack coat, the surface of the shoulders was not uniformly strong enough to carry the weight of the

(*Continued on page 28*)



C. & E. M. Photo
The 75-ton per hour Madsen plant for producing the hot-mix surface course for runways at an Inter-Mountain State Air Base.

Your post-war road or street program

A series of advertisements pointing out how TEXACO Asphaltic products can fit into your program

#4

TRAVEL PLANT SURFACING with TEXACO LIQUID ASPHALT

Large photo: Travel Plant at work on Wisconsin highway. Note windrow of aggregate uniformly coated with TEXACO Slow-curing Oil. Tank truck delivers TEXACO to Plant without interrupting work. *Small photo:* Travel Plant picks up untreated aggregate from windrow.

There are TEXACO Asphalt surfaces of the Travel Plant type in all parts of the country—proof in itself of the merit of this method of construction.

Frequently, all or part of the aggregate for a TEXACO surface of the Travel Plant type is found on the road or street to be surfaced—or near by. This eliminates or greatly reduces hauling of aggregate. Travel Plants turn out a large tonnage of TEXACO-coated aggregate per hour, making possible rapid completion of a project, with minimum inconvenience to traffic. A small crew of men and little equipment are needed where this method is employed.

The aggregate is bladed into a measured windrow along the road. Moving at a steady pace, the Travel Plant picks up aggregate from this windrow, thoroughly mixes it with TEXACO Asphalt and deposits the coated aggregate in another windrow behind it. Blade graders spread the mix to the desired depth and it is rolled.

TEXACO Cutback Asphalt, Slow-curing Oil and Emulsified Asphalt are all suitable for Travel Plant construction. Which TEXACO product to use depends upon the kind and grading of the aggregate. Tank trucks deliver TEXACO to the Travel Plant without interrupting its progress.

TEXACO Asphalt surfacing by Travel Plant may be the best answer to your post-war road or street problem. Keep it in mind.

THE TEXAS COMPANY, *Asphalt Sales Dept.*, 135 East 42nd St., New York City

Boston Philadelphia Richmond Chicago Houston Jacksonville

TEXACO REG. T. M.

TEXACO ASPHALT

Contractors and Engineers Monthly

THE NATIONAL BUSINESS PAPER FOR CIVIL ENGINEERING CONTRACTORS AND HIGHWAY ENGINEERS AND COMMISSIONERS

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Another War Product—Accessibility

When "made in U.S.A." construction equipment became combat equipment at Guadalcanal and Tunisia and elsewhere, the Marines, the Navy and the Army engineer troops quickly found the weak spots, if any, in each type of equipment. When repairs had to be made by flashlight, or in pitch darkness lest even the light of a match provide a target for an enemy sniper, the reports came back promptly, good or bad.

In general, the models selected by military construction engineers for this service stood up well. They had been tested in training camps and in maneuvers. One factor, however, caused the downfall of a few designs—lack of easy accessibility. Manufacturers have advertised "accessibility" over and over, but ease of repairs under a tent or even in an open field on the peaceful plains of the midwest or southwest, or in a shop complete with overhead crane, is a far cry from a tackle rigged to a palm tree and making adjustments and repairs by "feel".

A few, a very few, pieces of equipment were ruled out by at least one of the branches of the armed forces because "you can't repair it blindfolded". That was the very reply we received when, during the inspection of a training center for maintenance mechanics, we noted and commented on the absence of a certain unit well-established in civilian construction.

So, out of this war of machines, of construction equipment gone to the fighting front, we shall reap a great harvest of improvements for the peacetime construction to come, not the least of which will be increased accessibility of all parts of all equipment on which adjustments and repairs may be necessary.

Better Drainage—Less Maintenance

A traffic circle is an island completely surrounded by impervious pavement, yet the chances are ten to one that the circle will be graded to drain toward the periphery. This is especially bad practice in the frost belt where snow plowed onto the circle will melt and run back onto the pavement, freeze and create a traffic hazard.

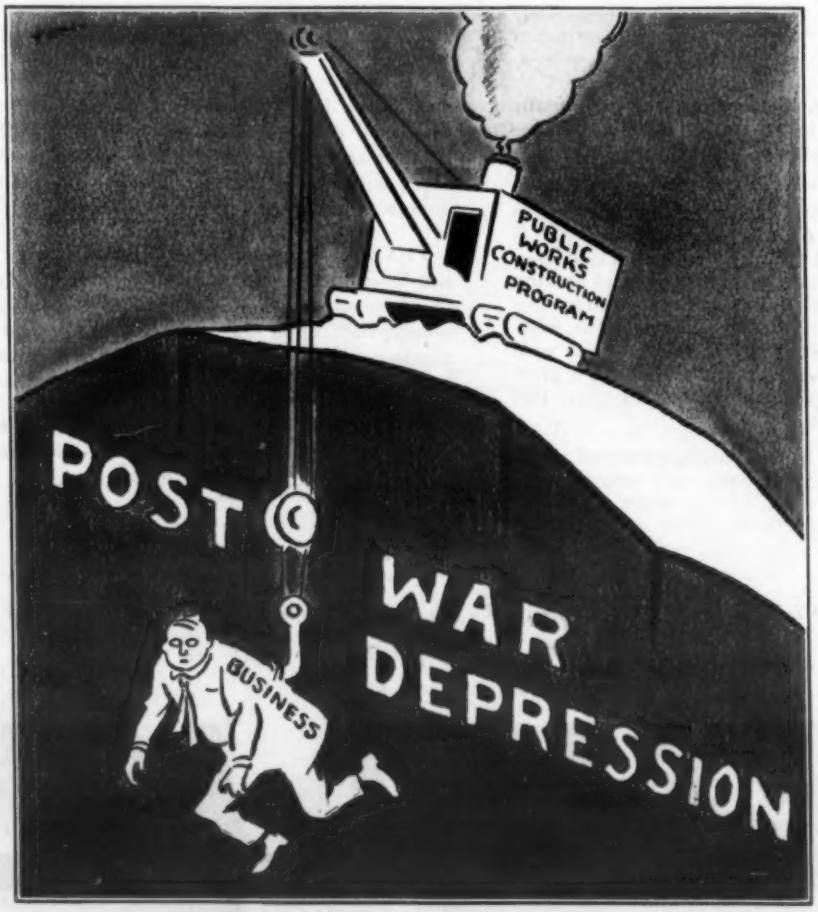
If the traffic circle is graded concave so that surface water will drain to a central catch basin and then be carried by a tile drain to the logical point of disposal, a snow storm will require a single activity for the maintenance division, one plowing, instead of plowing and then sanding the pavement every time some snow melts, runs out over the traveled way, and freezes.

There is another phase of this drainage problem common to both north and south that many design engineers have overlooked. A wide center strip on a divided highway may absorb a considerable quantity of water during protracted wet weather. The water percolates into the ground and, if the strip is graded from the center down to the curbs at either side, some of the surface water hastens toward the edges and increases the absorption near the pavement edge. In a number of places this has caused a weakening of the subgrade, the very foundation of the pavement.

To correct such a condition on one extensive boulevard highway we visited, a trench 12 inches wide and 16 inches deep was dug by hand between the edge of the pavement and the grass plot. This was filled with 8 inches of 2½ to 1-inch aggregate, covered by 4 inches of 1 to ½-inch aggregate, topped with ½ to ¼-inch aggregate and sealed with bitumen. This drain was tapped by an 8-inch tile laid across the road with sealed joints and discharging into the road ditch.

These are concrete examples of ill-considered design which create further work for the maintenance division. In these days of a scarcity of manpower, reduced highway income and the need to save as much material as we can, let's think three times, not just the twice of the old adage, before we permit a poor design to become permanent through construction.

We have advocated time and time again that no highway project should go through the design stage without the maintenance engineer, the construction engineer, the roadside development engineer, and the traffic and safety engineer each having had his opportunity to examine and improve the plans and collectively to discuss every point. Each viewpoint can contribute something to better and more economical design. Let's work together now more than ever before.

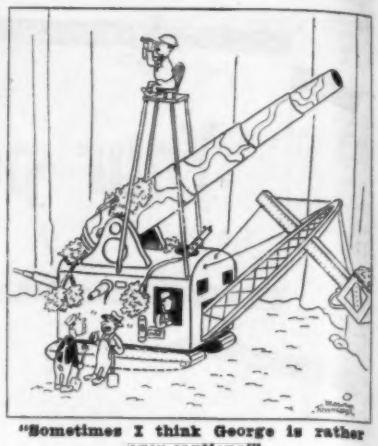


Engineer Shortage Is Becoming Acute

Thousands of engineers now employed on jobs non-essential to the prosecution of the war must transfer before the end of the year to more essential activities where an acute shortage of qualified engineers is developing, according to a report made to Paul V. McNutt, Chairman, War Manpower Commission, by the National Roster of Scientific and Specialized Personnel of the Commission's Bureau of Placement.

The report indicated that from the beginning to the end of 1943 there should be an increase of from 40,000 to 50,000 engineers in essential work and in the armed forces. It is estimated that at present there are about 280,000 American professional engineers, of whom 19 per cent are in the armed forces and in civilian jobs in the War and Navy Departments, 12 per cent are in other Government positions, 49 per cent are employed in manufacturing, mining and construction, while 20 per cent are employed in transportation, communications, public utilities, private consulting offices, colleges and universities.

The most acute shortages of engineers occur in the fields of electrical, radio, mechanical, aeronautical, marine, and industrial engineering. A shortage also exists in the fields of chemical, metallurgical, and sanitary engineering. As a result of the completion of war construction projects, a number of engineers, principally civil engineers, are being made available for work in other projects. The report stated that young adaptable civil engineers, with recent training in physics and mathematics,



"Sometimes I think George is rather over-cautious!"

who have had some courses in electrical or radio engineering, might after some special training be employed in a technical capacity in connection with radio detection, in which field there is a great demand for technical personnel.

The report points out that war industry is passing through its most critical phase, from the standpoint of engineering personnel needs. More engineers are required to start production and raise the production rate to capacity, the report stated, than are required for normal operation. When manufacturing plants reach the stage of routine production, they can better stand the loss of some of their technical personnel to the armed forces without curtailing operations.

The senior classes in all engineering colleges numbered only 17,000 for the academic year 1942-43, of which a survey showed that an estimated 6,400 were committed to the armed forces through the enlisted reserve programs. The military training of the nearly 40 per cent of the present senior engineering students committed to the armed forces through membership in reserve components is nominal, it was added. Except to the extent that these new engineers are needed to fill technical posts in the armed forces, it is felt that serious consideration should be given to releasing some of them to war industry, particularly those who have specialized in the most critical industrial engineering fields.

In order to meet the present and future engineering personnel needs, it is suggested that training programs can help so that the simple engineering tasks may be turned over to technical assistants, thus leaving trained engineers to carry on the work calling for thorough engineering training. It is also proposed that civil engineers may take such short training courses as will enable them to fill the demands for other types of engineers.

Twenty-Second Proceedings Of Highway Research Board

The *Proceedings* of the Twenty-Second Annual Meeting of the Highway Research Board, held in St. Louis last December, will be ready about July 24. This volume of approximately 500 pages contains the various papers and discussions presented at the meeting, covering such subjects as highway economics, design, materials and construction, maintenance, traffic, and soils, as well as special papers.

The Roadside Development Reports, mimeographed and amounting to approximately 125 pages, will be ready about August 1. They contain the divisional committee reports, and in the Appendices a selective annotated bibliography on Flight Strips and an ecological survey of the Pennsylvania Turnpike.

Copies of the *Proceedings* may be secured by non-members direct from the Highway Research Board, 2101 Constitution Ave., Washington, D.C. Price: $3.25. The price of the Roadside Development Reports is $1.00.

WPB Used Equipment Advisory Committee

The Director of Industry Advisory Committees, War Production Board, has announced the formation of the Used Construction Machinery Industry Advisory Committee as follows: L. W. Gardner, Howard-Cooper Corp., Portland, Ore.; C. G. Hewitt, L. B. Smith, Inc., Camp Hill, Penna.; Morton Hunter, Hunter Tractor & Machinery Co., Milwaukee, Wis.; Charles Wehner, Mississippi Valley Equipment Co., St. Louis, Mo.; William H. Ziegler, William H. Ziegler Co., Minneapolis, Minn.; Ed Phillips, Phillips Machinery Co., Richmond, Va.; James L. Nellis, Choctaw Culvert & Machinery Co., Memphis, Tenn.; Goodloe Yancey, Yancey Brothers Co., Atlanta, Ga.; Lewis W. Elphinstone, D. C. Elphinstone, Inc., Baltimore, Md.; H. O. Penn, H. O. Penn Machinery Co., New York, N.Y.

Maritime "M" Awards

The Maritime Commission's "M" pennant, the Maritime Victory Flag, and labor merit badges for excellence in production have been awarded to the following organizations: Air Reduction Co., Inc., New York City; Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Philadelphia, Penna.; Union Metal Mfg. Co., Canton, Ohio; and Merchant Marine Div., Westinghouse Electric & Mfg. Co., Philadelphia, Penna.

The following plants have received their first Gold Star awards: Homestead Valve Mfg. Co., Coraopolis, Penna.; Isaacson Iron Works, Seattle, Wash.; Linde Air Products Co., Inc., New York City; Minneapolis-Moline Power Implement Co., Minneapolis, Minn.; and Wickwire Spencer Steel Co., New York City.

New P & H Div. Manager

Formerly District Sales Manager for P & H excavators in western Pennsylvania and Ohio territories, Frank C. Edwards has been appointed Manager of the Carrier-Mounted Crane Division of the Harnischfeger Corp., Milwaukee, Wis. Mr. Edwards will make his headquarters at Newark, N.J., where the Harnischfeger carrier-crane plant is located.

YOUR "CATERPILLAR" DEALER

IS HERE TO STAY

NORTH and South, East and West, wherever a free flag flies, the "Caterpillar" dealer organization forms a solid network of service and distribution. The fact that this widespread organization came through the depression years with added strength and efficiency — and that it will come through the present trying period the same way — means much to you as a "Caterpillar" Diesel owner. You know your "Caterpillar" dealer is going to be there when you need him — today, tomorrow or next year.

Your "Caterpillar" dealer is a substantial citizen — a member of the community. He had to have capital, ability and integrity to start in business. And he will stay in it because he has faith in the success of "Caterpillar" Diesel Tractors, Engines and Road Machinery as a sure basis on which to build for the future. He believes that the outstanding record of "Caterpillar" Diesel equipment on the war fronts will build a still greater demand for these machines for the heavy jobs of reconstruction and peace.

He has a real and personal interest in the power users in his territory. He feels responsible for the satisfactory performance of every unit he has ever sold. Today his showroom may be empty of new machines, but you'll find his service department is busier and doing better work than ever.

His men are thoroughly trained for their jobs, many with factory experience. To meet your needs for service he has invested thousands of dollars in special tools, and they are proving their worth today in the maintenance and repair of machines that must stand the punishing pressure of wartime work at home.

He is making a real contribution to the war effort. Not only do "Caterpillar" Diesel owners depend on him for genuine parts and service, but the Government uses his facilities to keep machines in fighting trim. His modern shop practice enables him to save time and money for owners and conserve tons of war-needed metal.

Your "Caterpillar" dealer is the staunchest friend your heavy equipment could have today. Don't hesitate to call on him for honest and expert advice. If you need a new machine for war-essential work, he will help you apply for it. And if you can't obtain a new machine, he will do his utmost to keep your old equipment running.

ARMY (E) NAVY

CATERPILLAR DIESEL

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS • TO WIN THE WAR: WORK—FIGHT—BUY U. S. WAR BONDS!

Hints on Maintenance And Care of Roadsides

W. V. Buck, Senior Engineer for The Public Roads Administration In Ohio, Discusses Current Problems At Third Short Course, Ohio State U.

✦ THE shoulders, ditches and backslopes of our highways are in constant need of attention to prevent the destructive effect of erosion from undoing the work of construction. The agency responsible for this preventive work is "Maintenance," to whom these remarks are directed, along with the landscape architects and engineers who are potent allies of the maintenance divisions of highway departments. W. V. Buck, Public Roads Administration Senior Highway Engineer in Ohio, outlined these problems at the Third Short Course on Highway Development at Ohio State University last February.

On newly constructed shoulders, which are subject to rutting, it is well to level the shoulder by smoothing out the earth that has been displaced rather than to fill in the rut with additional earth. If the ruts are permitted to stay, they are liable to cause damaging erosion at the time of the next storm.

The most critical area of the shoulder on new construction is along the edge of the pavement where the straw mulch is easily whipped off by fast moving traffic running close to the edge of the pavement. Special care should be taken in tying down and otherwise protecting this strip of mulch immediately adjacent to the edge of the paved way.

A well-grassed roadside prevents erosion, but immediately after the seeding and mulching of a new slope, it is easily washed out. Mulched slopes should be inspected frequently after heavy rains to be certain that erosion has not started beneath the mulch. "Out-of-sight, out-of-mind" too often applies to mulched slopes.

To check erosion in ditches and around the headwalls of culverts, the use of sod is standard practice. If heavy run-off occurs soon after the sod is placed it is liable to wash beneath the sod, leaving the area in a worse condition than if there had been no sod whatsoever. All freshly sodded areas should be inspected promptly after heavy storms.

There are many soils which are unstable when saturated. Long slopes where such soils exist should be flattened during the construction, or reconstruction, of the highway and seeded under the direction of the landscape architect. Sloughing is the term applied to small breaks in the surface of unstable soil, while slips are the deeper more damaging breaks in the surface which require considerable work to repair.

The backslopes in deep cuts usually have too little topsoil to support vegetation. It is suggested that roadside mowings which will supply a seed crop be used as a mulch in locations of this character.

Newly mulched roadsides offer a perfect combination with heavy flows of water to clog ditches. After any rainstorm in a section which has been freshly mulched, an inspection should be made and the mulch cleared from the catch basins and the "dams" of mulch removed from the ditches. Otherwise this clogging can result in serious erosion.

It is always a good point to remember that, when roadsides are repaired in an "off" planting season, the use of roadside mowings as mulch is very good practice. The mulch will effectively check erosion and the seed carried by the mowings will start plant growth. Otherwise, the more expensive operation of seeding and mulching will have to be done in a proper planting season.

Before the days of roadside development and, at right, an easily and economically maintained roadside of the modern era in Ohio.

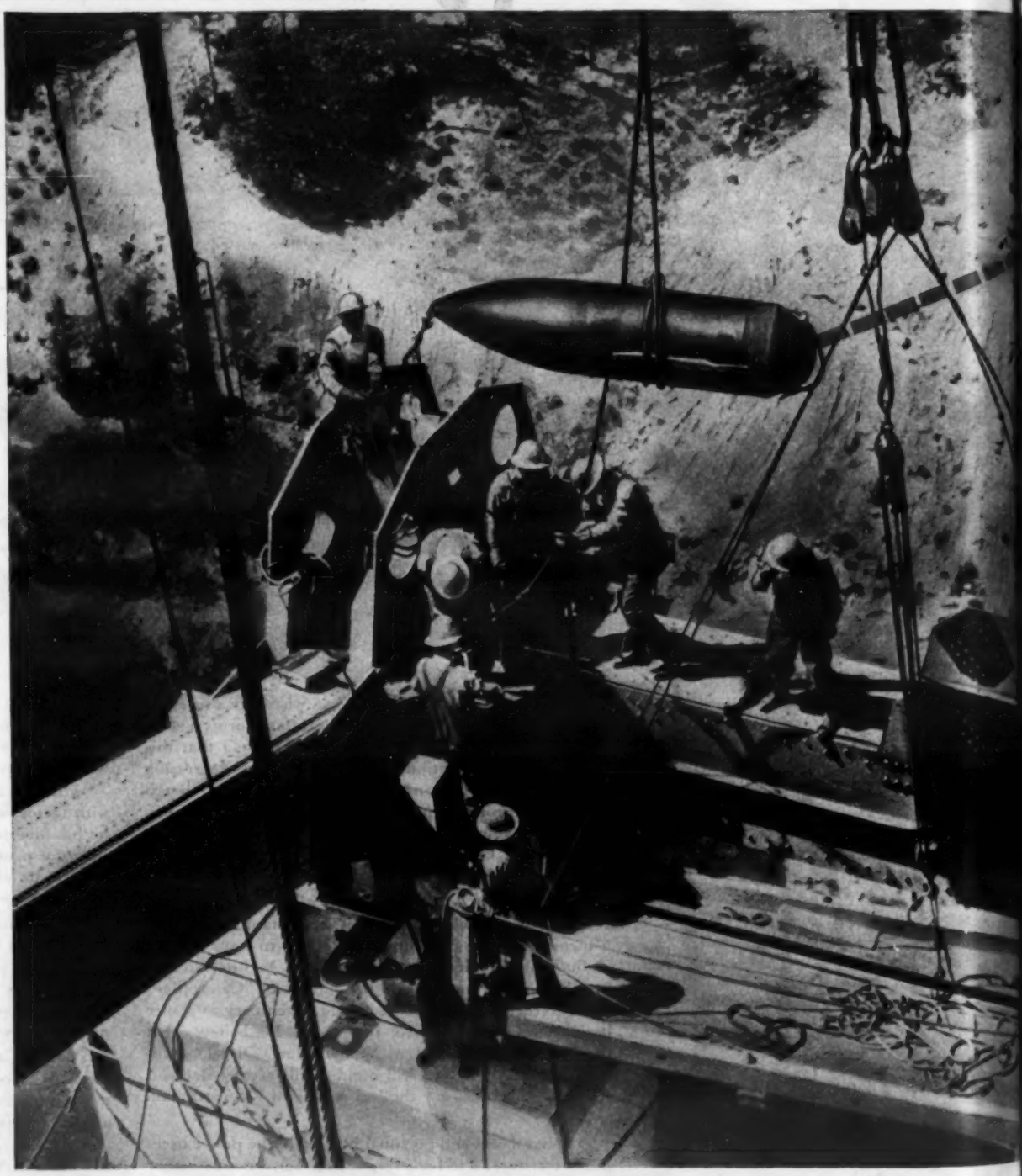
Care of Roadside Growth

All growth along the roadsides must be taken care of, whether it be grass, shrubbery or vines. When vines are planted on bad slopes where it is impracticable to establish sod or grass, it is nevertheless well to mulch the bare areas between them to check erosion and to hold moisture in the soil to enable the vines to establish themselves more quickly. All shrub areas should also be mulched for the same reason.

Large shrubs and trees have their place on roadsides but if they die and are not replaced they do not accomplish their purpose. Satisfactory maintenance is needed for all items on all roadsides.

New Plastic Paint To Protect Metals

A new permanently plastic material, which is applied like paint to protect boiler drums, metal, wood or concrete storage tanks and water-submerged surfaces against corrosion and fungus growths, is described in a new Serviron bulletin recently issued by Saverite Engineering Co., 1046 Clinton St., Hoboken, N. J. Serviron never dries hard, and stretches and contracts with temperature changes, thus eliminating the danger of hairline cracks in the coating which would permit undetected corrosion under the protective surface. The manufacturer states that Serviron will not melt, freeze, crack, or peel at temperatures from below freezing to 500-550 degrees F.



New Small Tournapull For Air-Borne Service

A new small unit in the earth-moving field which is revolutionary because it can be air-borne and even crash-landed for use on wartime fighting fronts has been introduced by R. G. LeTourneau, Inc., of Peoria, Ill. This D Tournapull, equipped with a 2-yard Carryall scraper and a Tiltdozer, has a flying weight of only 3¼ tons. Large pneumatic rubber tires give the unit more than ample flotation on soft surfaces and enable it to carry heavy loads over concrete roads and runways. It possesses speeds up to 18.8 miles per hour.

The D Tournapull is easily convertible, as it may be hooked to a flat-bed trailer capable of trucking a 7,000-pound tractor, ammunition, guns, or other military supplies, an 800 to 900-gallon fuel tank, or other weight equivalents. A LeTourneau crane, capable of lifting up to 4,000-pound lifts, can replace the trailer. In addition, a powerful Rooter tooth can be attached to the scraper to rip through baked earth or similar hard surfaces.

The new D Tournapull towing a flat-bed trailer, rustling dirt with a Tiltdozer, and working a 2-yard Carryall.

Close-coupled, compact in design, and as ruggedly built as the larger units, the D Tournapull, powered by a Continental motor developing 45 hp at 3,000 rpm, affords quick one-man wartime operation. It will undoubtedly have a wide sphere of activity in post-war days in townships and counties or wherever there is work in small volume where the larger units will not be economical.

Business goes where it is invited and stays where it is well treated.

Western Representative For Marlow Pumps Sales

Rolf L. Anderson, formerly of the American Can Co., has joined Marlow Pumps, Ridgewood, N.J., as special assistant to Philip Atkinson, Sales Manager. Mr. Anderson will cover some of the Western territory in connection with sales of Marlow self-priming centrifugal pumps, diaphragm pumps, plunger pumps, and high-pressure fire-fighting pumps to the contractors' equipment trade.

Road Maintenance Done by Contract

Contractors' Facilities Can Be Used Effectively And Economically to Keep Highways in Repair

By DWIGHT W. WINKELMAN, D. W. Winkelman Co., Syracuse, N.Y.

✦ NEVER has there been so much to do and so little with which to do it. This difficulty is presented in many ways in this World War II and the problem of maintaining our highways and streets is one of them. It is the purpose here to point out how the facilities of private contractors may be utilized to help in the solution of this problem.

The maintenance of highways and streets by contract after receiving competitive bids is not an untried method. In 1942 the Illinois Division of Highways carried on a $9,000,000 program of this kind on rural highways, and for 14 years, the repair of streets, alleys and sidewalks in the District of Columbia has been done by contractors at a considerable saving and in a very satisfactory manner.

Let us consider what conditions must be faced in 1943 and following years by those charged with the administration and care of our streets and highways, and how maintenance by contract fits into the situation.

Curtailment of Construction

The WPB has drastically curtailed all highway and street construction. In recent months, it has issued stop orders, even in cases where work had already started, and on projects to which it had previously granted preference ratings. The present WPB policy toward such construction has a two-fold aspect: first, unless the highway or street gives access to a military or naval reservation or to a war plant, it is considered non-essential; second, by stopping such "non-essential" projects, the labor, equipment and materials which would be used on them will be forced to move directly into the production of munitions.

There appears to be slight prospect of a major change in this policy, since our energies must be directed to an all-out effort toward Victory as soon as possible.

Extraordinary Maintenance

In a recent address, Commissioner of Public Roads Thomas H. MacDonald said, "The overwhelming evidence of the entire record of highway administration which lies behind us indicates but one solution to the enforced reduction in the rate of highway replacement by new construction. That solution is more expedient than sound. It is not economical, but it is mandatory. It consists of extraordinary maintenance, both more extensive and more intensive."

There are two forces which cause the deterioration of our highways and streets: the natural elements and the wear of traffic. The WPB and all our highway administrators combined can't stop a flood, or keep away freezing temperatures for a single night this winter. Deterioration by the forces of nature is an inevitable overhead on which compensation must be paid, war or no war, and regardless of the volume of traffic.

Extraordinary maintenance is the only alternative to the curtailment of the war effort by a breakdown in highway transportation. It is inevitable that WPB will recognize this by shaping its regulations to permit necessary road repairs.

Many Scarcities

Governmental agencies, state and lo-

(Concluded on page 54)

BULLET-SHAPED

...BUT NOT A PROJECTILE

SUSPENDED in mid-air, this projectile-like object (22" dia. x 8 ft. long) is a steel forging to help "pin" the bridge together. Assembling heavy steel members into bridge structures is a typical use of hoisting power made conveniently available through heavy-duty gasoline or Diesel engines.

To assure peak performance not only of hoisting machinery, but of trucks, tractors, bulldozers, etc., contractors everywhere are lubricating their heavy-duty gasoline and Diesel engines with Texaco.

Texaco Ursa Oil X★★ has both detergency and dispersion. Detergency keeps piston rings free and engine parts clean. Dispersion holds deposit-forming materials in suspension until drained at oil-change time. The use of this oil prevents scuffing of rings, pistons, cylinders . . . protects alloy bearings.

For quieter-running, longer-lasting transmission and differential gears, use *Texaco Thuban.*

So effective have Texaco lubricants proved that they are definitely preferred in many important fields, a few of which are listed below.

A Texaco Lubrication Engineer will gladly cooperate in the selection of the most suitable lubricants for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

THEY PREFER TEXACO

★ More buses, more bus lines and more bus-miles are lubricated and fueled with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

The new Cedarapids Morok 200-ton-an-hour portable crushing plant.

New 200-Ton-an-Hour Portable Crusher Unit

Of interest to aggregate producers and contractors for jobs requiring speedy aggregate production in large quantities is the announcement by the Iowa Mfg. Co., Cedar Rapids, Iowa, of its new Cedarapids Morok super-quarry crushing plant with a capacity of 200 tons of aggregate an hour. Knocked down into five units, consisting of a primary crushing plant, a secondary crushing plant, sizing screen and bin, control panel, and power unit, this big plant can be transported by truck at 30 or 40 miles an hour. It can be set up and put into operation or knocked down ready to travel in 3 or 4 hours, the manufacturer states.

Material is handled in a continuous flow from quarried rock to delivery trucks. From the steel flight apron of a heavy-duty rock feeder, rock is carried into the 25 x 40 primary jaw crusher, which will receive any rock that can pass through a 2-cubic yard shovel dipper. Clutch control provides a steady flow of rock into the crusher to eliminate the possibility of crusher choke-off. From the primary crusher, material is conveyed to a Cedarapids 4 x 12-foot double-deck horizontal vibrating screen. Largest oversize is fed to the secondary 10 x 36 roller-bearing jaw crusher, and the next oversize to the 40 x 24 roller-bearing roller crusher. Tailings of the secondary crushers are returned to the screen for grading. From the secondary plant, material moves to the bin unit, where a second 4 x 12-foot screen does final grading. A 40-yard-capacity two-compartment bin temporarily stores and delivers the material to trucks.

The plant is designed so that it can be driven either by electricity, by a combination of diesel and electric power, or by diesel power alone. In order to insure a smooth flow of aggregates through the plant, and to eliminate breakdowns, primary and secondary crusher plants, vibrating screens, and conveyors are independently driven. The entire plant is operated from a central control panel.

Designed for speedy transportation, assembly, and knock-down, the primary and secondary crushing plants are mounted on steel goose-neck trailers equipped with a fifth wheel and pneumatic tires. The conveyors, which can be dismantled quickly, are carried with the secondary unit. The bin legs are equipped with winches which lower the sizing screen into the bin, and the bin onto the truck. The winches also raise the bin and screen into place when setting up the unit.

Buy War Bonds Regularly!

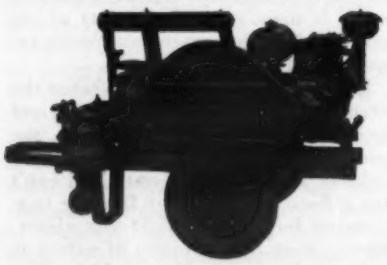
Don't Waste Air!

"Use the air you need but don't waste it" is the theme of a new series of industrial posters issued by the Ingersoll-Rand Co., manufacturer of air compressors and compressed-air-operated tools. The purpose of the series is to wage war on leaky hose couplings, valves, and other pipe fittings, and by so doing, to help speed production and avoid wasted power.

Printed in two colors, the posters make generous use of illustrations, keeping text to a minimum. In several of the posters, both the *right* and *wrong* way are graphically illustrated. At the present time, five posters of the series are available, while others are in preparation.

Copies of these helpful and instructive posters may be secured by those interested in displaying them on construction jobs and in state and county highway shops where compressed air is used by writing to the Ingersoll-Rand Co., 11 Broadway, New York City.

4" Single Mud Hog Pump on Pneumatic Wheels



The "Old Reliable" Mud Hog brought up to date.

Gearing enclosed—running in oil.

All cut gearing.

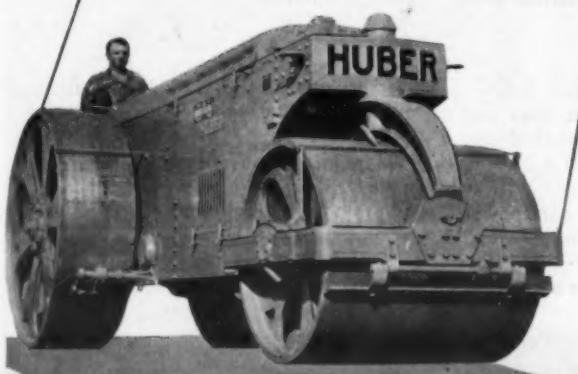
Die-forged crankshaft in pump.

Available for the duration in ball valve force type only. Flat valve open discharge discontinued for the duration.

Send for Bulletin No. CEM-40-E

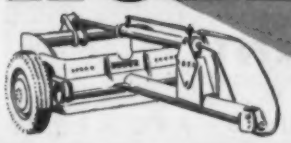
MARLOW PUMPS RIDGEWOOD, NEW JERSEY

O. W. I. PHOTO

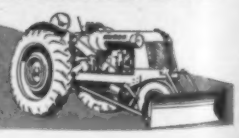


★ Modern mechanized warfare depends on mobility for its successful prosecution. This means airports and highways must be kept in constant repair. Huber Rollers, Speed Scoops and Bulldozers are doing this very job. Near many fighting fronts they are putting captured airports in shape so our airmen can have the advantage, and rebuilding highways the enemy tried to destroy so our troops and supplies can move forward unhampered.

HUBER *Automotive Type* **ROLLERS**



SPEED SCOOPS - BULLDOZERS



Batching Concrete For Large CWS Plant

Fast Operating Plant Had Big Part in Speeding the Completion of Work Within 5½ Months

GROUND was broken during the summer of 1942 for a large Chemical Warfare Service Plant, and 5½ to 6 months later it went into operation to serve the armed forces overseas. Speed such as that is a credit to the planning of the U. S. Engineer Corps and the ingenuity of the contractors in assembling the construction plant and materials. The handling of bulk cement and aggregates at the central batching plant is typical of the thoroughness of preparation for construction operations. Although two other batching plants were operated for short periods, this plant produced over 90 per cent of the batches for the 125,000 cubic yards of concrete used on the reservation.

Unloading Aggregates

In order to unload the aggregates for the batching plant and handle them rapidly enough to meet the demands of the truck mixers, the contractor had to make provision for delivery by hopper-bottom freight cars and by truck. All of the aggregates came from local pits and were wet which, in itself, probably aided in the use of the belt conveyors that were installed. Two pits were prepared beneath the railroad siding and so arranged that the freight cars could be dumped into the wooden hoppers direct. An extension on the outside permitted the trucks to end-dump into the same pits.

Two belt conveyors, one for each pit, that is one for the sand pit and one for the gravel pit, were installed with a 20 per cent grade, about 2 per cent steeper than experience has shown is advisable to prevent materials slipping on the belt and gravel rolling badly. The reason for the steep belts was the limited number of idlers available and the length of belt on hand, as no new material could be purchased. The conveyors were 122 feet long and delivered the two aggregates to separate stockpiles. The coarse aggregate, a gravel, was 1½-inch maximum size with an allowance of 5 per cent oversize. The sand was unusually good for concrete, with sharp well-graded grains. Because of the long drop from the top of the conveyor, particularly for the gravel, an Allis-Chalmers HD-10 tractor and bulldozer was used to move the coarse material up toward the top, and also to keep the Lima 660 crane supplied with materials without making it necessary for the crane to move along the pile of aggregates and thus lose time from loading the bins of the batching plant.

Bulk-Cement Storage

The bulk-cement storage consisted of a structure built of laminated timber with a double roof, one 12 inches above the other, and with the water-supply tank for the batching plant on top of the upper roof. The building had a capacity of 8,000 barrels of cement. An auxiliary tank or cement silo for the cement batching plant held about 100 barrels.

The cement storage shed was built alongside another railroad spur and had a concrete foundation with a 7 x 7-foot tunnel running through the long dimension of the shed. At the siding were two automatic unloaders for the box cars which were used to deliver the cement. These unloaders emptied the cement from the cars into the hoppers of screw conveyors which were connected to a longitudinal screw conveyor running through the tunnel and finally to a bucket elevator at one end which carried the cement up to the top-flight screw conveyor. At the top, a feeder box delivered cement to the batching silo as long as that receiver would hold more cement and then it delivered the balance to the top flight which deposited the cement into one of the three compartments into which the bin was divided. The entire bulk-cement unloading system and screw conveyors to storage were built and furnished by The Conveyor Co. of Los Angeles.

(*Concluded on page 22*)

C. & E. M. Photo
The complete aggregate and cement batching units at a new Chemical Warfare Service Plant.

LULL BEFORE THE STORM— *Photo Courtesy U. S. Marine Corps*

A detachment of U.S. Marines pauses in a jungle clearing for a brief rest en route to the front on a Jap infested island. Shortly after this photo was snapped, these Leathernecks drove an enemy band far into the hills.

ALWAYS ON THE MOVE . . . FIRST IN BATTLE . . . NEVER SAY QUIT—TOUGH, HARD-FIGHTING MARINES HAVE WHAT IT TAKES IN MEN AND EQUIPMENT!

Here the Drott Bull Clam Shovel clears site preparatory to making trench.

In seven minutes, digs trench and builds protective bank on the side.

Digging, clawing, busting its way through out-of-the-way jungles . . . where neither man nor equipment have ever trod . . . the Drott Bull Clam Shovel, manned by the Marines, builds airports, trails and roads; throws up barricades, protects and helps the men whose work makes us so proud.

Many of the countless applications of the Drott Bull Clam Shovel fully described in our literature. Wire or write for it.

DROTT EQUIPMENT

HI-WAY SERVICE CORPORATION
3841 W. WISCONSIN AVE., MILWAUKEE, WIS.
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UNIVERSAL
ARC WELDING ELECTRODES
and
GAS WELDING RODS
for
Steel, Cast Iron, Bronze, Aluminum die cast metal, and Hard Facing

Inquire also for Universal ARC and SPOT welders

Prompt Deliveries

UNIVERSAL POWER CORPORATION
4297 Euclid Avenue Cleveland, Ohio

Old Out-Moded Road Widened, Resurfaced

Beeline Highway Running Northward from Birmingham, Alabama, Improved with Asphalt by State Crew

(*Photo on page 64*)

✦ AN economical way to convert a narrow paved road with many cracks and broken sections into a fast, safe highway is shown in the recent repair of U. S. 31 extending north from Birmingham, Ala., toward Nashville, Tenn. The work is part of an extensive maintenance program started by the Alabama State Highway Department long before the era of asphalt "freezes".

The program has demonstrated its value as force-account work, using hired and penal labor and some WPA help in the earlier phases. The aim of the Department is to set a standard by which road renewal jobs may be let to private contractors in the future. With this in mind, the Department set up its own quarries along the route and also used a portable asphalt plant with drier to provide its own leveling and surfacing courses.

Widening

While the old road was narrow and broken in places, its alignment and grade were fairly satisfactory and this dictated its renewal instead of the construction of a new highway on new location. The original portland-cement pavement was 18 feet wide and of 9-6-6-9-inch cross section.

In order to widen the road, a trench 3 feet wide was excavated 9 inches deep on either side of the pavement and the material trucked away. The trench was partially filled with crushed stone and then given a seal course of asphalt and stone placed on top and tamped. These two 3-foot widening strips gave the highway a 24-foot base, only 22 feet of which was resurfaced with the binder and hot-mix courses.

Binder Course

All shattered areas in the pavement were cut out and filled with a cold plant-mix compacted by a square tamper in a pneumatic paving breaker. The surface was then swept clean and 0.35 gallon per square yard of MC-5 asphaltic oil applied hot by a Littleford bituminous distributor. The asphalt was immediately covered by 0.85 cubic foot per square yard of 1½ to ¾-inch crushed stone spread through a home-made tail-gate device as the trucks backed so as to run on the stone, rather than on the asphalt. The stone was broomed by hand and later by a rotary mechanical broom to distribute it more uniformly and then the binder course was compacted by a 10-ton roller.

The surface was next dry-choked with 0.08 cubic foot per square yard of material passing a ¾-inch screen but retained on a No. 8 screen. This material was broomed for even distribution and rolled by a Galion 10-ton tandem roller. An additional 0.55 gallon of MC-5 was applied by the pressure distributor followed by the spreading of 0.27 cubic foot of ¾ to ½-inch stone. The brooming and rolling of this last application continued for two days although traffic was turned onto the road immediately.

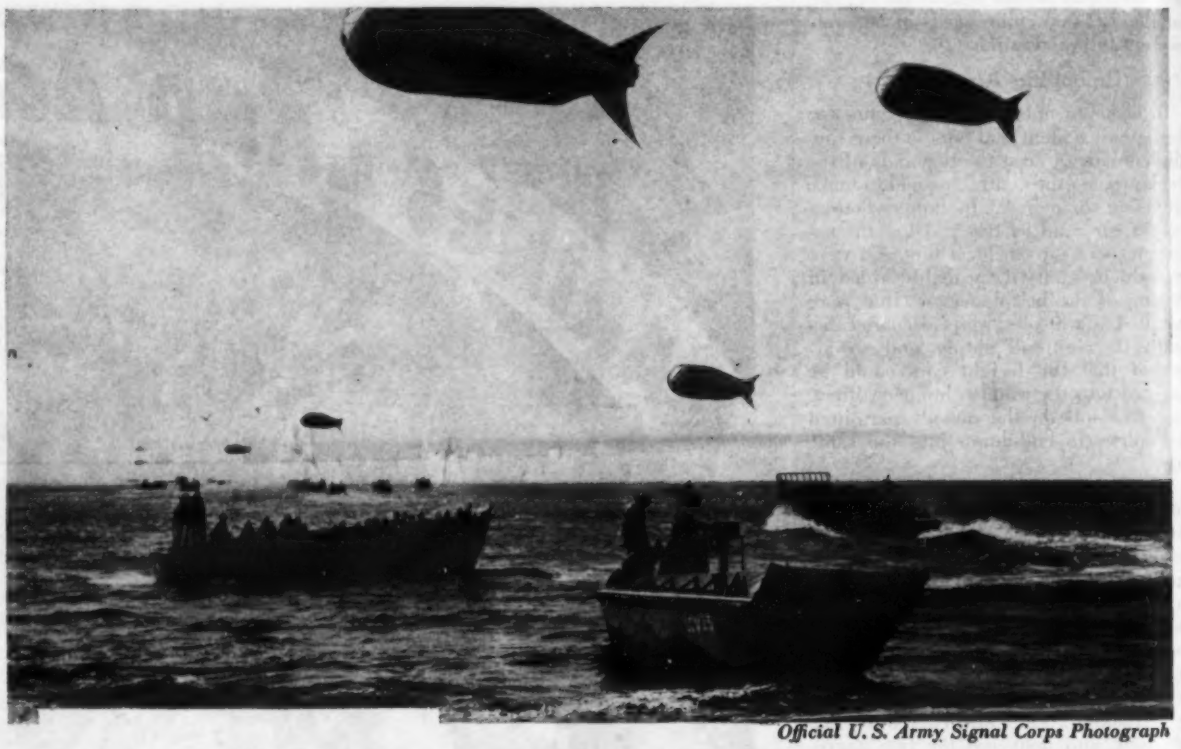
Although this type of binder course is somewhat rough, it preserves the pavement and provides a temporary non-skid surface until subsequent surfacing is applied as funds and materials become available. The Government restrictions on the use of asphalt for paving have caused some delay in the program.

A Littleford distributor applying hot MC-5 asphalt for the mat or binder course on U. S. 31 in Alabama.

The Hot-Mix Courses

Crushed stone for the hot-mix, as well as for the binder course, was quarried from the side of a mountain along the highway and moved largely by gravity through the processing. The Cedarapids

(*Concluded on page 40*)

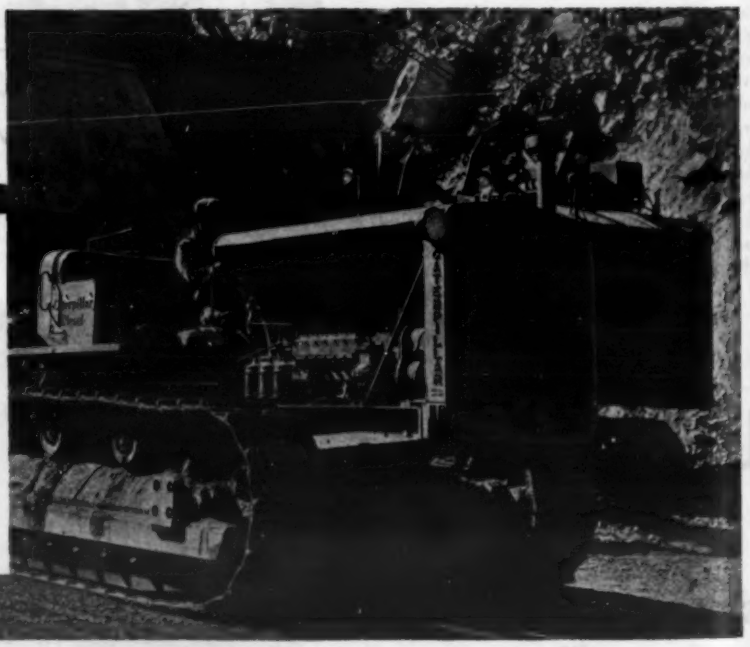


Official U. S. Army Signal Corps Photograph

BIG PUSH ABROAD needs all-out support at home. For increased service hours from *CONSTRUCTION* equipment use . . .

SINCLAIR SPECIALIZED LUBRICANTS. These oils and greases give *safe* lubrication in continuous operation, and overload emergencies.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



SINCLAIR LUBRICANTS-FUELS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

SINCLAIR REFINING COMPANY (Inc.)

2540 West Cermak Road, Chicago • 10 West 51st Street, New York City • Rialto Bldg., Kansas City • 573 West Peachtree Street, Atlanta • Fair Building, Ft. Worth

Rebuild your TRACTOR GROUSERS WITH BULLDOG Grip-Lugs

EASILY WELDED

Send for Catalog C

Inquiries invited from Dealers and Salesmen

ALLIED STEEL PRODUCTS, INC.

M. B. C. Bldg. Cleveland, Ohio

More Clean Dry Air For Shop Services

A new 8-page bulletin, No. 543, has been released by the Logan Engineering Co., 4900 Lawrence Ave., Chicago, Ill., on the Aridifier which cleans and dries compressed air by centrifugal force. These units are being used to aid war production today, but many shops and garages are planning their installation for post-war improvements in compressed air lines. This bulletin shows how the compact, cast units are placed in the line, and complete specifications are given for sizes from ⅜ to 10-inch.

Copies of Bulletin No. 543 will be sent to readers of CONTRACTORS AND ENGINEERS MONTHLY on request. Write to the manufacturer and mention this review.

Kohn Made Manager Of Fulton Canvas Div.

As successor to H. B. Marbury, Manager of the Canvas Division of the Fulton Bag & Cotton Mills, Atlanta, Ga., for many years and who recently passed away, G. E. Kohn, who has been associated with the company for a long period, has been appointed to that position.

Fulton manufactures Shuredry and Fultex waterproofed tarpaulins, which are seeing heavy service in this country as well as overseas. Fulton quality tents are being used in many contractors' camps as well as by the armed forces. Another product used extensively in the construction industry is the Fulton concrete curing mat.

35" Clearance with Doors Wide Open
Turns at will off the windrow. No doors dragging in the dirt to slow up the unit and prevent sharp angle turning.

High Dumping Clearance Speeds Operation to New Records—with the HEIL Bottom-Dump Trailer Wagon

By employing a construction principle long accepted in other construction equipment but never before used in a dump wagon, Heil engineers have made possible a totally new standard of performance for this type of equipment. The high clearance doors are POWER-OPENED in 2 seconds. The Heil cable power control unit is direct-connected to the tractor engine, and operates independently of the tractor transmission at any time when the engine is running. The dumping operation is under fingertip control. The load lets go all at once or spreads as with a cable scraper, at the will of the operator. This new Heil unit dumps and gets away in a flash. You need it to compete successfully in post-war earthmoving operations. Get the complete story now and be prepared. Post-war orders now being accepted. Write for bulletin. R-12

Clamshell Principle

The familiar clamshell is *opened* by power, *swings closed* by gravity. That is exactly how this new Heil unit operates. When the dumping doors are pulled open by CABLE POWER, the doors swing up alongside the hopper — out of the way. The high clearance doors are interlocked, completely synchronized, fast and positive in operation. Patented construction.

Left: Heil Cable Scraper Interchangeable on Same Power Unit
Right: Heil Hydraulic Bulldozers

The HEIL Company is engaged in all-out war production for Victory

ENLIST WITH THE "SEABEES" SEABEES

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 7, WISCONSIN

Expanded Water Supply For Hampton Roads Area

(*Continued from page* 1)

ter was of good quality in the early tests and also it seemed possible to develop about 1 mgd per well. Further tests revealed that the water had a high fluoride content and consequently the city decided not to develop the well project.

This led to consideration of the development of a project which had first been considered during World War I, on the Chickahominy River, one of the northerly tributaries of the James River. This project, which is now being constructed, is costing about $2,700,000, including a filter plant as well as the pipe lines. The main supply line consists of 32 miles of 34 and 39-inch Lock Joint concrete pipe. These odd diameters were chosen because of the availability of steel forms for pipe of these sizes. The Lock Joint Pipe Co. set up its manufacturing plant at Ewell, Va., the largest plant it has erected for any project, and has been producing 100 16-foot lengths of pipe per day. (See C. & E. M., September, 1942, pages 28-29.)

A 20-inch Transite pipe line extends from the end of the Chickahominy supply line near Harwoods Mill Reservoir to supply water to Big Bethel Reservoir, the principal source of supply for the Fort Monroe and Langley Field Reservations.

Federal Financing

Newport News was unable to contribute materially to the cost of this project with municipal funds, so it asked the Federal Works Agency for a 100 per cent grant. In addition to the 32-mile pipe line, another 14 miles of 24, 27 and 34-inch Lock Joint pipe was laid to reinforce the existing transmission system between the original Newport News filter plant and the city. For this purpose a grant of $785,000 was made the city, but in the case of the larger project, costing $2,700,000, the Federal Works Agency decided to retain owner-

C. & E. M. Photo

A river crossing of one of the Lock Joint pipe lines, showing an arched section to permit the passage of small boats.

ship of the works and charge the communities for service. Newsom & Aldrich, because of their extensive studies and knowledge of the problems, became consulting engineers for the Federal Works Agency on these projects.

As a part of this larger project, an additional filter plant of 6-mgd capacity is being built at Lee Hall adjacent to the old 8-mgd plant. This latter plant, because of age and design, could dependably produce only 6 mgd, so that the new addition doubles this capacity. Upon completion of the addition, the old plant will be overhauled to bring it up to rated capacity. At the Lee Hall plant, a 3,000,000-gallon (3-mg) clear-water basin, 173 feet in diameter, has been built. The bottom and walls of the basin are of plain concrete and the only reinforcing steel used is in the flat slab roof and supports.

In the fall of 1942, the Navy decided to build Camp Peary at Magruder, Va., to train upwards of 50,000 Seabees, the Construction Battalions for overseas service. This camp required 6 mgd to be taken from the middle of the 32-mile concrete-pipe line. In order to furnish this service, an earth dam, known as Waller Dam, was built near Williamsburg to impound 1,500,000,000 (1.5 billion) gallons as storage.

The 32-mile concrete-pipe line from Chickahominy River to Newport News and environs would supply 22 mgd to that area, including 8 mgd from the original reservoir watersheds. This vol-

(*Continued on next page*)

Now Available

● For many years, Barber-Greene has published data on bituminous construction for its own engineers and servicemen. As this material was seen by others in the industry, many requests were received for such data. The compilation of this data into the B-G Bituminous Construction Handbook is the result.

The Handbook has been completely revised with this issue, greatly amplifying the general engineering data. It is not a picture book or catalog. It is a compilation of material our organization has gathered through close contact with construction operations in this country and abroad.

The Handbook is now available (without charge) to contractors and engineers. Because of paper and material shortages, we hope only those having a definite need or interest in this field will request these Handbooks. Address your request to: Bituminous Equipment Sales, Barber-Greene Company, Aurora, Ill., U. S. A. 43-1

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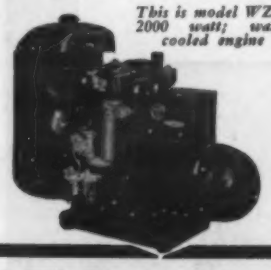

This is model WZC, 2000 watt; water cooled engine

D. W. Onan & Sons
1231 Royalston Ave., Minneapolis, Minn.

Ingenuity … Water-S…

(*Continued fr…*

ume of water wa… the needs of the … work, but all of … other developme… the 6 mgd requir… a yearly average … secured from the … 280 square mile… pumps could not … 365 days per yea… because, in dry … and fall flows … pumps' capacity. … sary to store wa… is accomplished … the low-level C… wood-pile and sh… der construction … 000,000 gallons …

The original … not contemplate … mission mains f… port News. Thes… added another $… the project and … Chickahominy … $1,000,000, maki… 000.

Pipe …

In order to be … ditional amounts … demand now a… been made to in… the pipe line f… Newport News by … a hydraulic tric… Chickahominy … Waller Reservoir … pipe line, the c… increased from … dropping the lov… draulic grade lin… from Waller … News, the grade … originally planne… point of the pipe … ened so that the … line will deliver … mgd will come … during dry year… ished later during … fall.

This plan for … of water through … the minimum of…

genuity Features Water-Supply Project

(*Continued from preceding page*)

of water was about 350 per cent of eeds of the area at the start of the , but all of this was absorbed by developments without including mgd required by the Seabees. Only arly average of 14 mgd could be ed from the Chickahominy River's square miles of watershed as the ps could not be run at full rating days per year using the river intake use, in dry years, the late summer fall flows were much below the ps' capacity. This made it neces- to store water in the river. This complished by the construction of low-level Chickahominy Dam, a l-pile and sheet-piling dam now un- construction behind which 1,500,- 000 gallons can be impounded.

e original $2,700,000 project did ontemplate certain of the new trans- ion mains from Lee Hall to New- News. These, as pointed out above, d another $800,000 to the cost of project and then the Waller and kahominy Dams added another 0,000, making a total of $4,500,-

Pipe Line Tricks

order to be prepared to furnish ad- nal amounts of water beyond the nd now anticipated, plans have made to increase the capacity of pipe line from Chickahominy to port News by what might be termed draulic trick. By pumping from kahominy Reservoir to the new er Reservoir near the middle of the line, the capacity of the line is ased from 20 mgd to 22 mgd by ping the lower end of the low hy- lic grade line. Then by repumping Waller Reservoir to Newport s, the grade line is raised above its nally planned elevation at the mid- of the pipe line and is thus steep- so that the lower end of the pipe will deliver 27 mgd. This extra 5 will come from Waller Reservoir g dry years and can be replen- later during years of average rain-

is plan for increasing the delivery ater through the new pipe line uses minimum of critical materials to

Construction Details

Details on the methods of construction for various phases of this work will be given in subsequent articles in this series on the Hampton Roads area water-supply projects.

make the system perform above its peak design.

The Norfolk Project

On the Norfolk side of the James River a total of 13.5 mgd was being consumed for domestic and other purposes before the development and expansion of military projects. The plans for the Burnt Mills project doubled the capacity of the system, to 27 mgd. In the spring of 1942, the planned military and manufacturing activities in the Norfolk-Portsmouth area expanded so greatly that the 27 mgd was not enough.

This made it necessary to extend the project to the west to acquire more water. The first watershed encountered is that of the Blackwater River but, although it has a drainage area of 300 square miles, its flow is reduced to zero in extremely dry weather. Because this could not be depended upon during a severe drought, it was necessary to go still further west to the Nottoway River which has a drainage area of 1,400 square miles. The water is diverted at a point 23 miles from the farther edge of the Norfolk reservoir system. This required the construction, under the supervision of the consulting engineers, of a 42-inch Lock Joint concrete transmission line crossing the Blackwater River and continuing to a point 20 miles from its beginning where the pipe line splits into two parts, a 36-inch branch going direct to Norfolk and a 30-inch line running to the edge of the Portsmouth watersheds.

A pumping station was built at each river for most economical operation. These pumping stations are rather unusual structures as they had to be built

Interior view of the 4-mg filtered-water reservoir, with groined arches eliminating the use of a steel reinforced roof, at Portsmouth, Va.

in a section where there is a very poor foundation and with a large portion of the station below the elevation of high

(*Concluded on page 31*)

THE ADVANCE GUARD
for
POST-WAR PLANNING

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Trucks loaded with war materials just east of the Bedford Interchange on the Pennsylvania Turnpike. Trucks are now producing 72 per cent of the toll highway's revenue, moving 21,000,000 pounds of freight per day over the road.

Trucks Main Revenue For Penna. Turnpike

The place of super-highways as a solution to the transportation problems in highly industrialized and heavily populated areas, such as New England and the north Atlantic states, and the middle west between Chicago and St. Louis, is being widely discussed in connection with a post-war highway construction program. One of the factors involved in the discussion is whether or not tolls should be charged on such express highways. It has been pointed out that, although one proposed program for a 1,200-mile network of super-highways would cost a billion dollars, by charging tolls as is done on the Pennsylvania Turnpike, the tax-payer would bear no burden, as all construction and operation costs would be on a self-liquidating basis.

In this connection, a recent survey of truck freight hauled and revenues derived therefrom on the Pennsylvania Turnpike, made by Mack Trucks, Inc., is of interest. This study revealed that 21,000,000 pounds of freight per day, 85 per cent of it essential war materials, is being trucked over the Turnpike. Valued at more than $1,500,000, this truck freight is producing over 70 per cent of the Turnpike's present daily revenue, despite the fact that all military convoys move toll-free over the highway.

In checking the Turnpike figures for the truck survey, Mack went back as far as October, 1940, when passenger cars accounted for 89 per cent of the road's traffic, allowing trucks 10 per cent and buses the remaining 1 per cent. From October 1, 1940, to the same date in 1941, trucks paid 30 per cent of the Turnpike's revenue; passenger cars brought in 61 per cent; buses, 2 per cent; and the remaining 7 per cent was made up of miscellaneous revenue.

By October, 1942, the truck revenue over the 160-mile Turnpike had mounted to 52 per cent, with passenger cars dropping to 40 per cent. Then by the first quarter of this year, truck revenue hit 72 per cent and the passenger-car contribution faded to 22 per cent.

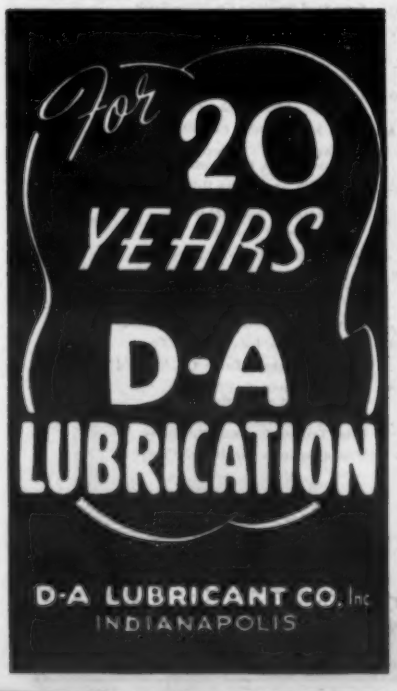
The Mack survey figures show that even though the Turnpike is a toll road, 95 per cent of all trucking between the midwest and east, through the area of the Turnpike, uses this route. The trucks have been gaining two extra trips a month in this way, thus hauling approximately 20 per cent more freight with the same equipment. In addition, the survey disclosed that trucks save an average of 5 hours driving time per trip, 12 gallons of gasoline, a quart of oil, and 9,000 feet of vertical climb by traversing the Turnpike.

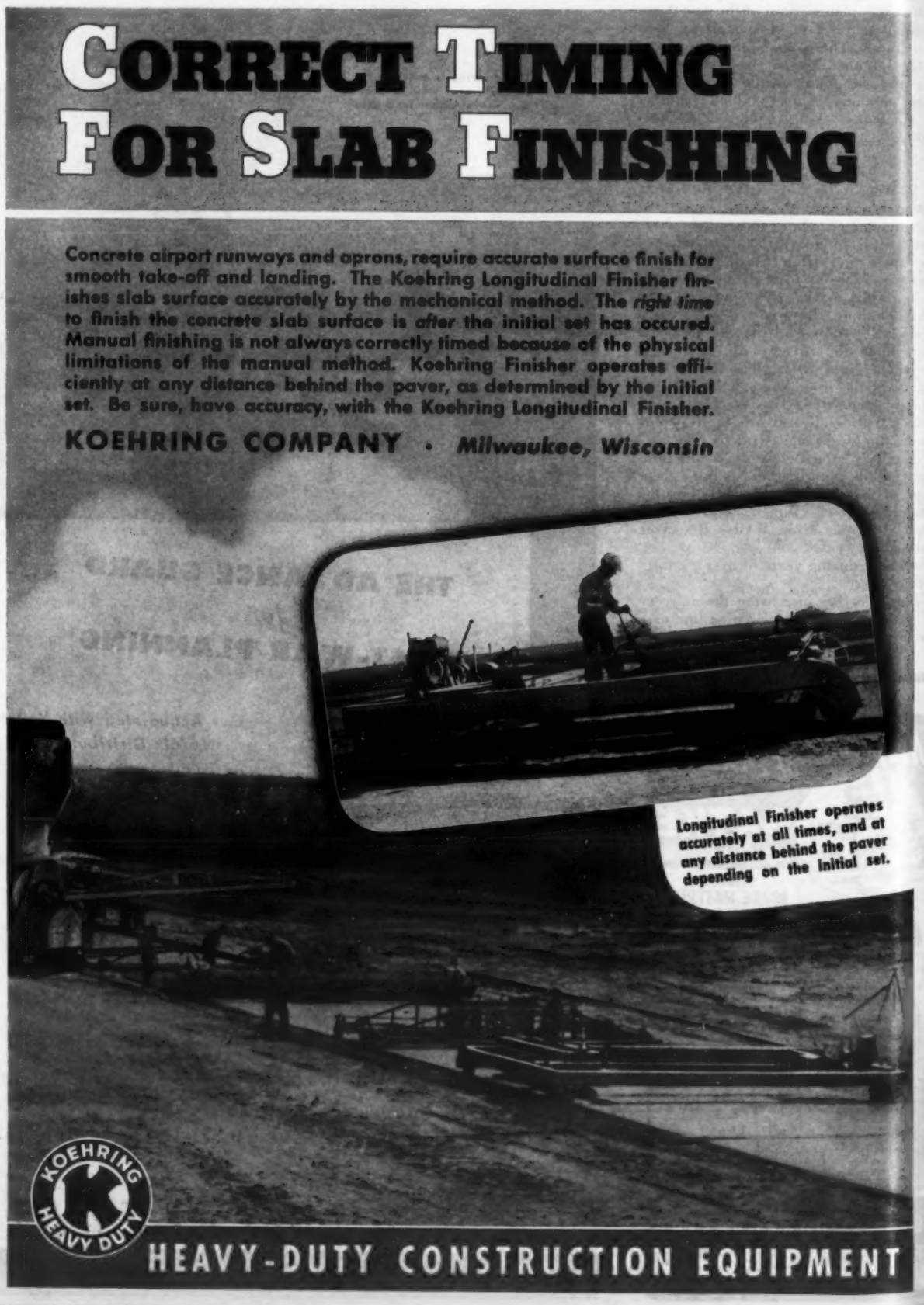
Even though today's revenues from this super-highway are considerably below those received prior to Pearl Harbor, these revenues continue to make the Turnpike a paying proposition. T. J. Evans, Vice Chairman of the Pennsylvania Turnpike Commission, told members making the survey that the Commission now has the legislative authority to extend the road from its western terminus at Irwin, just outside of Pittsburgh, to the Ohio or West Virginia state line. At the same time, the eastern terminus at Middlesex, on the outskirts of Harrisburg, will be extended to Philadelphia, thus providing a limited-access super-highway completely across Pennsylvania. This work will begin at the conclusion of the war.

Operation and Care Of Air Compressors

A 42-page Operator's Instruction Manual covering the operation, care, and maintenance of portable, industrial, Auto-Air, and Track-Air compressors, made by Davey Compressor Co., Kent, Ohio, has recently been issued by that company. In addition to giving the details of these portable compressors, it gives full information on the Davey Split-Propeller heavy-duty truck power take-off, and includes a complete supplement on the operation and maintenance of pneumatic tools.

Copies of this book may be secured direct from Davey Compressor Co. by those interested by mentioning this item.




CORRECT TIMING FOR SLAB FINISHING
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Short-Span Bridges Built Of Non-Critical Material

Timber Superstructures Built in New Hampshire; Methods and Costs Show Economy of Plan

By H. E. LANGLEY, Bridge Engineer, New Hampshire State Highway Department

(*Photo on page 64*)

♦ DURING the autumn of 1941 it became very difficult to obtain the usual structural materials required for the maintenance and construction of highway bridges in New Hampshire. A survey of the situation indicated that structural steel shapes and steel reinforcing bars would be unobtainable for use on most of the bridges which would normally be constructed in 1942.

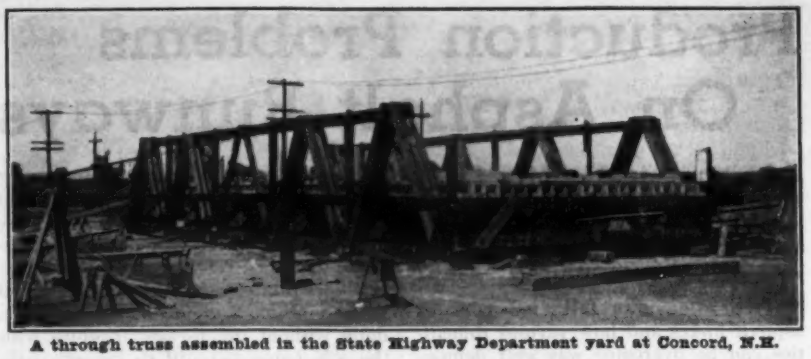
This normal bridge construction program is due, in general, to two basic reasons. The first is the obsolescence of existing bridges due to their inability to carry modern traffic with reasonable safety and the second is the result of change in location or design of portions of existing highways and to the elimination of railroad grade crossings. Those in the first group usually have been in service many years and are substandard in strength as well as in roadway clearances. Frequently bridges in this class have reached such a condition that it is no longer feasible to maintain them properly. The second group includes structures which are usually substandard because of roadway clearances, occasionally because of insufficient strength, and frequently because of their location which prevents securing a location and alignment of the adjacent highway satisfactory for modern traffic. To these two main groups should be added another relatively small group which includes structures damaged or destroyed by flood or accident.

In New Hampshire there are approximately 900 bridges on the state highway system. Of this number about 150 have been rated as substandard for civilian traffic and a somewhat larger number for military traffic. A large portion of these structures have short spans which vary in length from 20 to 70 feet. Past experience indicated that some of these structures would require replacement if continuous service was to be maintained over the entire state system. From a review of the non-critical materials satisfactory for bridge construction, it was evident that, in general, there would be three available. These were stone masonry, mass concrete masonry, and timber. With the exception of cement and the hardware required in timber construction, all other materials were produced within the state.

Use of Timber Planned

Because of the conditions just outlined, the New Hampshire State Highway Department during the winter of 1941-1942 developed plans for two stone arch bridges and several wooden superstructures for spans varying in length from 20 to 65 feet. For timber spans under 30 feet, simple stringer types were used, and for spans 30 feet and over, deck or through pony trusses. All of these designs provided for a 24-foot clear roadway and a live load capacity of H-15. As these timber superstructures could be fabricated and stored at some central point until needed, emergency replacements were assured with little curtailment of highway traffic.

The principal items of hardware needed in considerable amounts were timber connector rings, bolts, nuts, washers, and spikes. The Teco connector rings were purchased with little difficulty. Some of the bolts and all of the washers were made at the State Highway Department maintenance shops. The balance of the bolts were secured from a salvaged stock of used bolts. Only a portion of the required spikes could be purchased so a program of salvaging and straightening used spikes was inaugurated. This proved quite successful so that sufficient spikes were available.



A through truss assembled in the State Highway Department yard at Concord, N.H.

Fabrication

These superstructures were fabricated and stored at the Department's yard at Concord. After the members of a superstructure were fabricated, it was erected on blocking to assure proper connections and fit. All bolts, nuts, washers, and

(*Continued on page 38*)

Teaming Tractors and Tournapulls for More Effective Production...

Big Capacity Carryall Scrapers pouring material on the fill of this Northwest Airbase. Big tires help compact the material as it is spread in thin layers by the Carryalls.

LeTourneau Fleet Owners Use Tractors for Pusher-Loading, Short Hauls and Rooting . . . Gain Time and Money on Long Hauls with Tournapulls

To move 6,500,000 cu. yds. on a Northwest Airbase, Johnson, Inc., Minnis & Moody, alert Western contractors, have skillfully combined "Caterpillar" tractors, big capacity Carryalls and Tournapulls to get maximum efficiency from tractor power and Tournapull speed.

Pusher Loaded

"Caterpillar" D8 tractors, equipped with LeTourneau Dozers, pusher load all Carryall Scrapers—both Tournapull and tractor-drawn—to speed loading. Between loads these same pusher tractors doze dirt on the very short hauls; two of them also pull Rooters to break up hard gravel for faster Carryall loading.

Big-Capacity Carryalls

Large Carryall Scrapers (23 and 30-yards heaped) are matched with the big power of "Caterpillar" D8 tractors on hauls around 1000 feet one way. Studies by our Field Engineers show these big-yardage Carryalls pusher loaded on same hauls, increase Tractor Yardage 20 to 30%, compared with ordinary 12 to 15-yard scrapers not pusher loaded.

Tournapulls on Long Hauls

On longer hauls of 3500 feet and beyond from a different borrow pit, Tournapulls combine 11 to 15 yards heaped capacity with speeds up to 14.3 m.p.h. One-man operated, these Tournapulls eliminate need for extra loading and spreading tools, thus save time, manpower and equipment investment.

Like these successful LeTourneau fleet owners, you can gain time and increase yardage with Tournapulls and big-capacity Carryall Scrapers.

What About Deliveries?

Like most other equipment manufacturers, the Army, Navy and Marines have first call on what we build. A few LeTourneau units, though, are available for release through WPB. See your LeTourneau-"Caterpillar" dealer for priorities required.

Johnson, Inc., Minnis and Moody's Tournapulls move loads like this on hauls of over a mile at speeds up to 14 m.p.h.

Loading is laid out so loaded Tournapull gets a downhill start, thus reaches top speed quicker.

Use 34 LeTourneau Units

Johnson, Inc., Minnis & Moody believe in standardizing on LeTourneau, have the following units on this airbase:

- 8 Super C Tournapulls with 15-yard Carryalls
- 5 Std. C Tournapulls with 11-yard Carryalls
- 9 30-yard Carryall Scrapers tractor-drawn
- 4 23-yard Carryall Scrapers tractor-drawn
- 6 Dozers
- 2 Rooters

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Production Problems On Asphalt Runways

Admixture in Hot-Mix Licks Wet-Aggregate Difficulties And Cool-Weather Trouble At British Columbia Field

✦ THE value of a full knowledge of asphalt mixes and how various difficulties can be overcome was well demonstrated during the construction of hot-mix asphalt runways at a new airport in British Columbia during rainy weather. The annual rainfall is around 180 inches, with as much as 30 inches in one month, which makes mud the major trial of construction men.

The job consisted of building an airport out of a primeval forest on a muskeg bottom 2 to 5 feet deep on hardpan. The various operations included: logging, saw-mill operation, plank tracks for the trucks, clearing out a mixture of muskeg and blasted stumps and roots, filling in with large-sized gravel from nearby banks, leveling off the runway with smaller bank-run gravel, rolling this base course under constant wet conditions, and finally topping the runway with 3 inches of a hot-mix of 1-inch semi-crushed bank-run gravel, without priming the base.

Drying the Aggregate

The bank-run gravel contained some silt and clay and averaged 12 per cent water. It was passed through two short cylindrical driers, each equipped with two oil burners using a Bunker B fuel oil. The prevailing December temperature on the job was around 40 degrees F. with freezing sometimes in the early morning. During most of the time it was impossible to raise the temperature of the gravel to the desired 285 degrees F. This meant a serious slowing down of the drier speed and a lengthening of the mixing cycle in the pugmill. The asphalt, a 100-penetration material, was heated to 285 degrees before being delivered to the pugmill. Due to the drier trouble, many loads went from the mixer to the spreader too stiff to be laid easily, although the haul was short.

Improving the Mix

When Herbert P. Pearson, Technical Director of Kotal Co., reached this job to help solve the problem, he arranged a 1,000-ton demonstration of hot-mix production, overcoming these adverse conditions. The first thing he did was to establish a 230-degree F. mixing temperature for the gravel. A small quantity of Kotal was dissolved in a little fuel oil having an initial boiling point of 500 degrees F. This was thrown onto the gravel in the mixing box and was run for 5 seconds. Then a pail of hydrated lime was thrown in and mixed for 10 seconds. Finally the 100-penetration asphalt heated to 285 degrees F. was run in and mixed, the complete mixing cycle taking only 65 seconds. It was soon found necessary to reduce the quantity of asphalt by more than 7 per cent because the mix was too fat. The mixing operation was thus greatly speeded and simplified and the laying could be done without the former troubles with the mix being too stiff to spread easily on the gravel base.

Some doubt was expressed by the engineers as to the effect of the fuel oil on the asphalt, but this was dispelled by a hot-mix report previously made by a well-known independent laboratory. It was found that the indicated stability of the asphalt-fuel oil-Kotal-lime mix was actually greater than that of the corresponding mix of dry aggregate without any addition but the asphalt. Hot-mixes made in this same way in the past, using both Topeka and sheet-asphalt sand, although containing considerable water, have been through two winters of freezing and thawing without showing a defect.

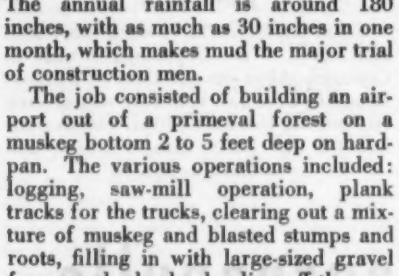
New Dragline Bucket Has Special Features

One of the features of the new dragline bucket known as the Dragliner is its combination bumpers and drag-chain hitches. When the empty bucket is dropped, it lands on the bumpers which are designed to take the shock and in this way, the arch, which is back of the bumpers, is protected. These bumpers also shield the drag hitches so that the bucket does not fall on them, thus providing longer life for the hitches.

The Dragliner, designed and sold by the Daniels-Murtaugh Co., Cedar Rapids, Iowa, and built by the Universal Engineering Corp., also of Cedar Rapids, has been subjected to tough service tests and is designed throughout to withstand severe operating conditions. Ribbed reinforcing sections are present at all points of stress and wear. The weight is well distributed, permitting a low hitch, so that the bucket takes hold in tight material without a tendency to stand on its nose, the manufacturer reports.

Replaceable manganese-steel lips give support to the arch at its base. The ends of the arch fit into recesses in the lip casting. The bumpers tie the lip, arch and body firmly together. The manufacturer points out that there are no interior obstructions to retard digging and the bucket shape is conducive to fast loading and clean dumping. Lips with either four or five teeth, and a one-piece or two-piece tooth with renewable point are available. Both types are keyed to the lip in the customary manner.

An 8-page Bulletin D containing a complete description of these Draglines may be secured by those interested direct from Daniels-Murtaugh Co. Just mention CONTRACTORS AND ENGINEERS MONTHLY.



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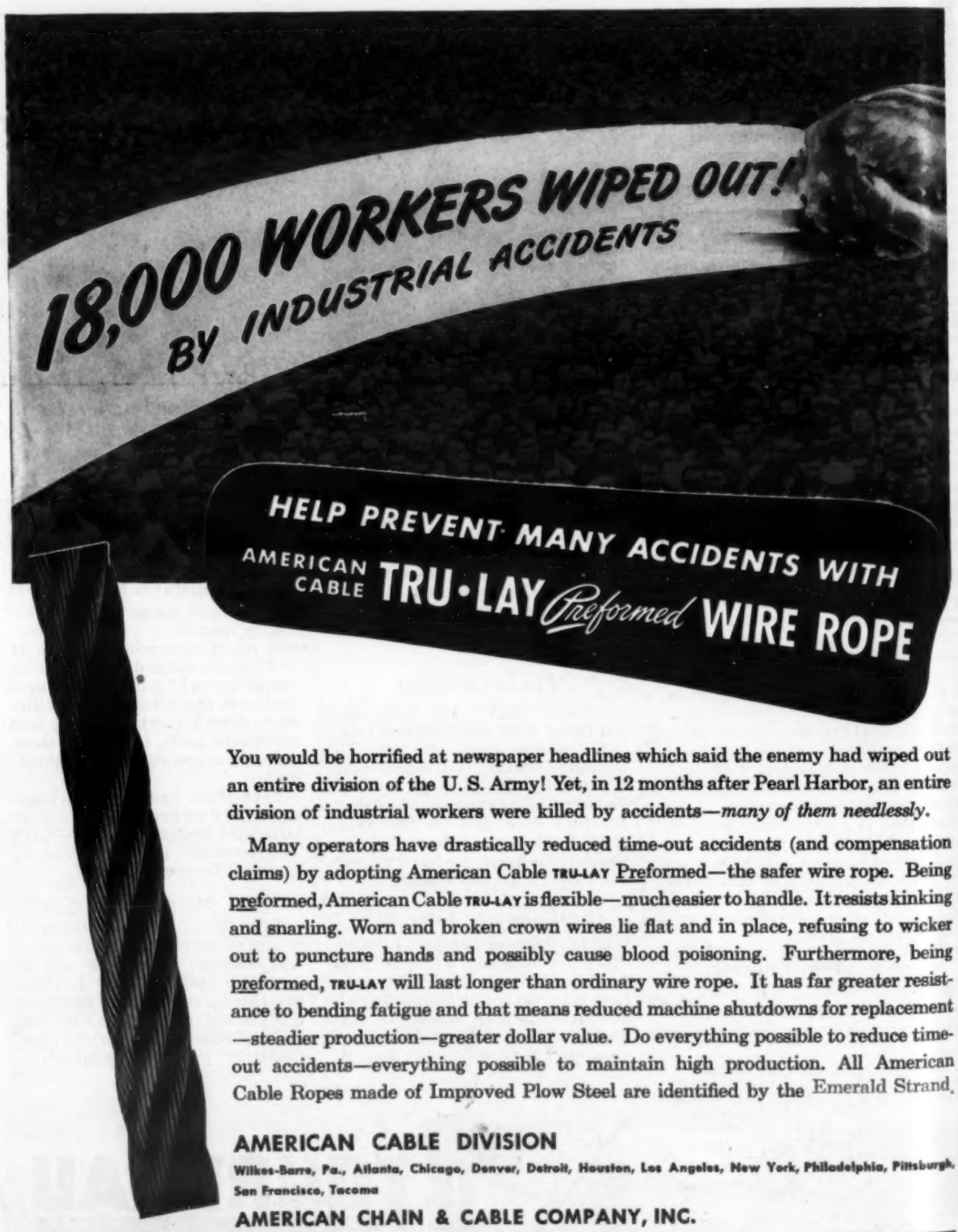
ASPHALT KETTLES AND SPRAYERS

Marvel Equipment Manufacturers, Inc.
224 So. Michigan Ave., Chicago, Ill.


18,000 WORKERS WIPED OUT!
BY INDUSTRIAL ACCIDENTS
HELP PREVENT MANY ACCIDENTS WITH
AMERICAN CABLE TRU•LAY Preformed WIRE ROPE

You would be horrified at newspaper headlines which said the enemy had wiped out an entire division of the U. S. Army! Yet, in 12 months after Pearl Harbor, an entire division of industrial workers were killed by accidents—*many of them needlessly*.

Many operators have drastically reduced time-out accidents (and compensation claims) by adopting American Cable TRU-LAY Preformed—the safer wire rope. Being preformed, American Cable TRU-LAY is flexible—much easier to handle. It resists kinking and snarling. Worn and broken crown wires lie flat and in place, refusing to wicker out to puncture hands and possibly cause blood poisoning. Furthermore, being preformed, TRU-LAY will last longer than ordinary wire rope. It has far greater resistance to bending fatigue and that means reduced machine shutdowns for replacement—steadier production—greater dollar value. Do everything possible to reduce time-out accidents—everything possible to maintain high production. All American Cable Ropes made of Improved Plow Steel are identified by the Emerald Strand.

AMERICAN CABLE DIVISION

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Tacoma

AMERICAN CHAIN & CABLE COMPANY, INC.

BRIDGEPORT, CONNECTICUT

ESSENTIAL PRODUCTS . . . TRU-LAY Aircraft, Automotive, and Industrial Controls, TRU-LOC Aircraft Terminals, AMERICAN CABLE Wire Rope, TRU-STOP Brakes, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Castings, CAMPBELL Cutting Machines, FORD Hoists, Trolleys, HAZARD Wire Rope, Yacht Rigging, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*

WPB Asks Contractors To List Idle Machines

Methods of attracting idle machines into the normal channels of distribution for resale were discussed at length by the Used Construction Machinery Industry Advisory Committee with WPB and other Government officials in Washington recently. It was pointed out to members of the Committee that many contractors who had worked on army-camp construction are still holding large stocks of equipment in idleness in expectation of further construction.

Many contractors fail to realize that the need for new posts and stations for Army and Navy is practically non-existent and that the holding of construction equipment in idleness in the expectation of future military contracts may be a definite obstruction to other vital wartime projects.

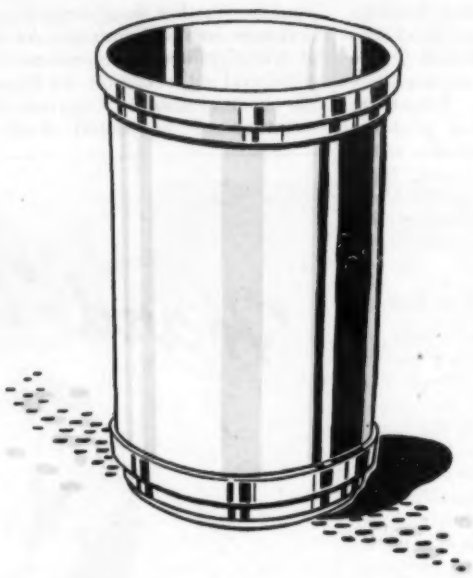
WPB officials reported that their Regional Offices constantly receive requests for machines for a wide variety of civilian uses. The critical repair parts situation and the problem of reconditioning and general repair still affect putting much used equipment to work.

Black-Top Equipment

Its line of construction and repair equipment for black-top paving on airport runways, access roads, and highways is the subject of a new bulletin recently issued by Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio. Described and illustrated are the Littleford 84-HD kettle for double-quick heating and production of materials; the Littleford Trail-O-Roller for either construction or repair jobs; the No. 101 Utility spray tank which will handle tar, asphalt, emulsion, cut-back, or road oil, and is available in sizes from 300 to 1,200 gallons; and the line of Littleford emulsion sprayers.

Copies of this bulletin called "Be on the Double Quick" may be secured direct from the manufacturer.

You can buy a new tie in 3 minutes...



but it may take weeks to renew a scored cylinder

The answer is Preventive Maintenance now with Shell Diesel Lubricants

SHELL

When rings stick, allowing hot gases to blow-by the pistons, it's good-by cylinder liners and piston rings . . . parts you can't always get when you need them. Then, too, there's that matter of an idle piece of equipment while new parts are installed. Many of these time-wasting failures can be avoided by careful attention to lubrication.

In peacetime, Diesels were operated under more or less normal conditions. But today, engines are being worked harder and for longer, continuous periods of time. This means oil should be changed at more frequent intervals.

Yes, these more frequent changes do take time. But the few minutes they do take may save you days of delay later. Don't wait for a breakdown. Call in the Shell man now. Let him help you plan your Preventive Maintenance.

ARMY E NAVY

First oil refinery to win Army-Navy "E"— Shell's Wood River Refinery.

SHELL DIESEL LUBRICANTS AND SHELL "DIESELINE"

U. S. E. D. Reports Plans For Post-War Flood Control

(*Continued from page 2*)

war and food shipments, broke "Big Inch", halted war work in at least one of the largest plants in Peoria, Ill., and, but for diligent sand-bagging of all building entrances, would have brought work to a standstill at another large plant in the same city.

Reports from gaging stations throughout most of this area, except along the Mississippi itself, show that the high-water marks of 1937, 1926, 1913, and back to 1844 were topped, necessitating a further revision of post-war control plans. Improper control, or too great a wartime emphasis on power development at dams which combine flood control and power in their services, led to flood conditions along the streams they were supposed to protect. Yes, there must be carefully conceived post-war flood-control plans, and there are, as the following authorized statement from Major General Eugene Reybold, Chief of Engineers, U. S. Army, prepared for CONTRACTORS AND ENGINEERS MONTHLY, indicates:

Reybold Reports Post-War Plans

"During the past year-and-a-half the Corps of Engineers has carried out the greatest program of military construction of all time. In spite of the magnitude of this accomplishment, the Corps of Engineers has, however, been able to continue its program of advance planning for civil works construction in a very considerable measure without interfering with its military responsibilities. This advance planning is being carried on during the present wartime conditions with the purpose of having completely designed projects ready for immediate advertising when needed. This shelf of projects which can be placed under way after the war, without the usual delay required for the preparation of plans and specifications, will constitute an important element in the post-war public-works program.

"At the present time the designs, plans, and specifications for more than fifty flood-control projects are under way with funds heretofore provided by Congress. The Department's Civil Functions Appropriation Act for the coming fiscal year contains provisions for undertaking the detailed plans for a considerable number of additional projects. The total cost of these authorized flood-control projects for which planning funds have been made available is approximately $385,000,000. These projects range in size and type from local protection projects costing a little more than $100,000 up to large multiple-purpose reservoirs with a cost in excess of $25,000,000. Their locations are scattered throughout the major river basins of the country, including such important river systems as the Ohio, Susquehanna, Ouachita, Arkansas, White, Missouri, Republican, Tennessee, Connecticut, Willamette, and Los Angeles.

"In addition to the advance planning for authorized flood-control projects as outlined above, another potential reservoir of construction projects may become available from the recommendations for further flood-control construction now before Congress. As a result of investigations made pursuant to Congressional authorization, the Department has recommended to Congress the construction of additional flood-control works totaling over $300,000,000 in cost. The detailed designs and plans for these additional projects can be undertaken as soon as Congress provides the necessary authority and funds for that purpose.

"Aside from the aforementioned sources of post-war construction projects, the resumption of construction on flood-control projects which have been stopped during the war in order to conserve critical materials and man-power will also contribute materially to the post-war public-works program. Construction work amounting to a total cost of $158,000,000 for flood-control projects remains to be done to complete those suspended projects after the war. The plans for this work have been largely completed so that construction may be resumed immediately upon the removal of the existing wartime restrictions on this type of work."

State and Local Programs

Combined flood-control, power-development, and irrigation projects, amounting to nearly 150 in number, have been studied recently by state and local agencies in the watersheds of the Arkansas, Red, and White Rivers of the Arkansas Valley. Thus far, the projects are only in the "considered desirable" class, needing finances for the field work and drafting-table routine to get them into shape for actual construction. In this territory alone, the total estimated cost of projects involving protection from and use of water is more than $2,000,000,000. However, studies show that this sum could be expended profitably and still not represent full development.

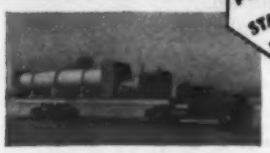
The Colorado River Basin, the Missouri River Valley, and the Central Valley of California represent other areas coming under this category, with the first and last known more for the development of irrigation projects.

Montana has been carrying on a series of state-sponsored irrigation projects for a period of about seven years under the direction of the Montana Water Conservation Board. These projects are in-

(*Continued on next page*)

ASPHALT MIXING PLANTS

PORTABLE and STATIONARY



★ Hetherington & Berner asphalt mixing plants, products of the pioneer builder of asphalt machinery in America, incorporate the latest features of design which have been proved in performance. Specifications conform to the most rigid state and city requirements, both as to engineering design and safety regulations. *Write for Bulletin CE-260.*

HETHERINGTON & BERNER INC.
Indianapolis, Indiana

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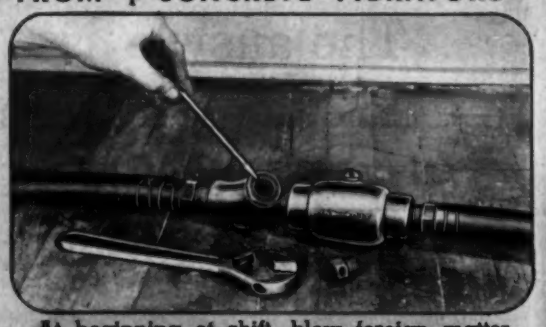
Hard-Working Vibrators DESERVE REGULAR LUBRICATION

Each model designed for a specific kind of concrete placement . . . free of flexible shafts or speed step-up gears . . . ruggedly built . . . all CP Concrete Vibrators give continuous, low-cost performance. With regular lubrication and a few other preventive maintenance steps (to be described in future advertisements) CP Vibrators show remarkably low maintenance costs. For example, four CP Vibrators placed a total of 312,000 cubic yards of concrete at a repair parts cost of 1.7 mills per cubic yard.

HOW TO GET MAXIMUM SERVICE FROM CP CONCRETE VIBRATORS

Fill reservoir at beginning of every shift with light oil — "Aerolene" or S. A. E. 10.



At beginning of shift, blow foreign matter out of air strainer, water out of air line.

Every 100 working hours, saw tack-weld, remove housing; clean and lubricate spindle.

Each week, grease both ends of drive shaft, also drive shaft gear and rotor shaft gear.

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PNEUMATIC TOOLS
ELECTRIC TOOLS
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ROCK DRILLS

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

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AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

Planning Under Way For Post-War Projects

(*Continued from preceding page*)

tended to supplement the inadequate water supply of land already under irrigation. The program, started in 1936, has included the construction of Glacier Lake, Cooney, Smith River, and Willow Creek Dams, which have greatly benefited the farms and ranches of Montana, the owners of which are paying for the project on a water-rental basis. This project was stopped by the war as regards new construction, but Montana has continued its work with field surveys and the completion of plans for a new series of projects, to be built after the war, at a cost of approximately $15,000,000.

Another state reclamation project has been instituted in Florida to conserve the natural resources of the great Everglades area, under the direction of the Glades Drainage District Commission. The aim of this project is to conserve water supply, improve drainage conditions and fire control, and generally improve the region. This will be a huge post-war project, although it is hoped that some work may be done to coordinate and prepare plans now so that the work may go ahead very soon after the war ends.

The ultimate in conservation of our water resources involves a program of continuous protection of agricultural and industrial areas from flooding in conjunction with soil conservation. Starting with the farm, contour plowing, as developed and demonstrated by Dr. H. H. Bennett, Chief, Soil Conservation Service, Department of Agriculture, prevents the first mad rush of silt-laden waters to the nearest brook. From this point on the problems are those which must be handled by larger organizations and groups, such as the states and the Federal Government through the Corps of Engineers. The fertile soils of America must not all be stripped from arable land and deposited in the Gulf of Mexico, nor must we permit flood waters to reduce production on farms or within our industrial plants.

Planning Program Moves

Although the number of "considered desirable" projects is constantly increasing through the planning of many groups, it is heartening to be able to report that the President and the Congress are providing funds to change the "considered desirable" status to that of "ready for letting" by providing funds for the acquisition of rights-of-way and designs so that the work may go to the plans and specifications stage ready for letting almost at a moment's notice.

Bureau of Reclamation Photo

This highest earth-fill dam in the world, work on which was "stopped for the duration", figures prominently in the Bureau of Reclamation's post-war public works program for stabilization of employment and orderly development of the West.

Under flood control, the National Resources Planning Board has also listed projects proposed by the Tennessee Valley Authority and the International Boundary Commission of the United States and Mexico. The projects reported by the Tennessee Valley Authority involve protection of areas along the Tennessee River and tributaries. The International Boundary Commission proposes a series of projects for protection of the areas along the Rio Grande and other rivers along the Mexican border. The National Resources Planning Board summary of the Federal Post-War Construction and Improvement Program to be carried out by Federal construction agencies alone, as of January 1, 1943, shows $500,000,000 as

(*Continued on page* 50)

MARVEL-KOTE

MEMBRANE

CURING COMPOUND

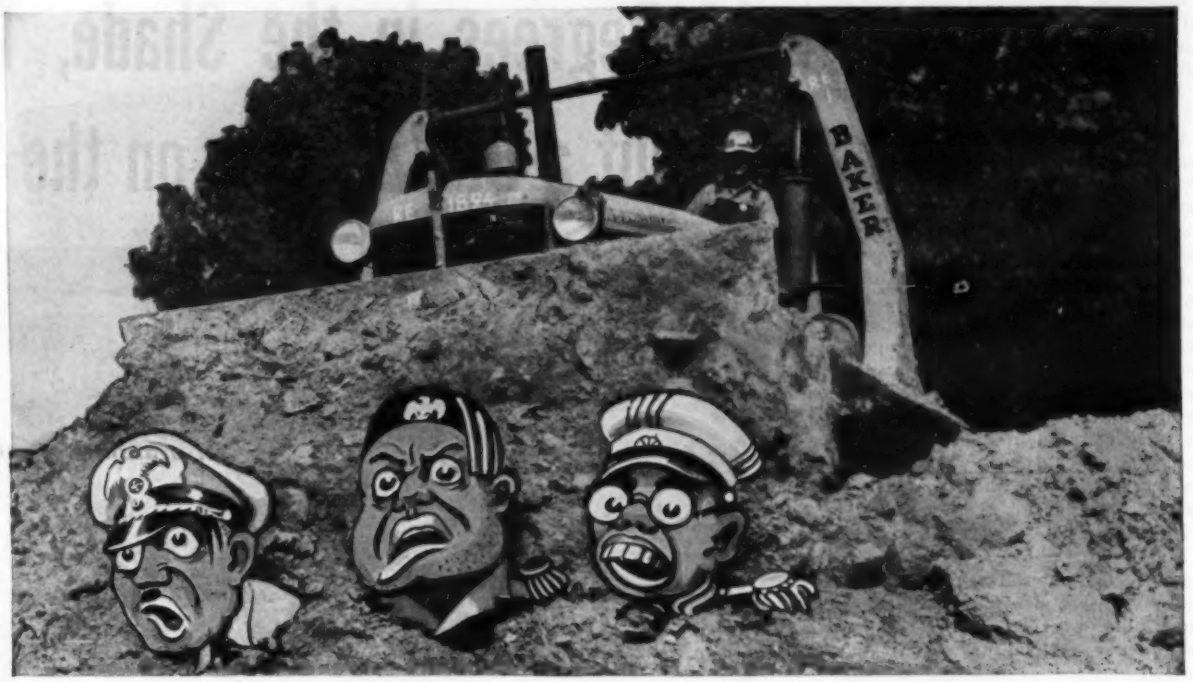
FOR ALL CONCRETE SURFACES

Meets Federal and State Specifications

ALSO

ASPHALT ROOF COATINGS
ROOF AND METAL PAINTS
CAULKING COMPOUND
PLASTER BOND
RUST PREVENTIVE
OTHER WATER-PROOFING SPECIALTIES

CONCRETE CHEMICAL CO.
310 Railway Exchange Bldg.
Kansas City, Mo.



Direct Down-Pressure on the Axis!

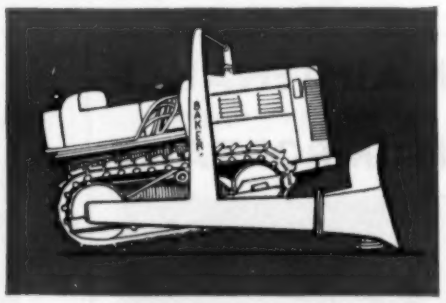
The exclusive direct lift and down-pressure of the blade on Baker Hydraulic Bulldozers and Grade-builders is a pain in the neck to Axis chest thumpers.

This simple, positive method of control permits the entire weight of the tractor front end to be exerted on the blade—the blade does not depend on its weight alone to force it into the ground. That's why Bakers get out bigger loads faster, every trip, all through each shift.

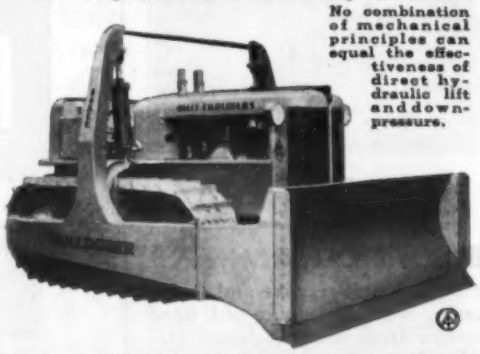
Their ruggedness and simplicity cuts maintenance costs to the bone. Their design makes the tractor engine more accessible. And they have all of the other features—moldboard level on rough ground, quick interchangeability of moldboards, tractor back end available for winch, etc. that you want in a bulldozer.

Beside rushing camps, landing fields and war plant sites to completion, Bakers are making landing strips in dense jungles and on desert sands, clearing debris from bombed cities, extending military roads in the frozen North and bringing direct down-pressure to bear on foes of democracy in other ways.

THE BAKER MANUFACTURING CO.
585 Stanford Avenue Springfield, Illinois



Baker Hydraulic Bulldozers *really* bear down!



No combination of mechanical principles can equal the effectiveness of direct hydraulic lift and down-pressure.

BAKER

The Modern Tractor Equipment Line for
EARTH MOVING
LEVELING AND GRADE BUILDING
SNOW REMOVAL
ROAD MAINTENANCE

Hal G. Sours, Director, and J. P. Shumaker, Division Engineer, Ohio Department of Highways, inspect one of the Department's tractors on farm duty. Over 9,000 acres of farmland were made ready for planting by renting state tractors to farmers.

State Highway Dept. Machines Do Plowing

Spring plowing and harrowing were weeks behind schedule in Ohio because of adverse weather conditions and the shortage of man-power and machinery. Throughout Ohio, farmers were finding it impossible to maintain their plowing, harrowing, and planting schedules. The rainy weather, inability to get parts for farm machinery on short notice, lack of labor, and other factors entered into the situation.

The Ohio Department of Highways went to the rescue of Buckeye farmers by providing the services of state-owned tractors to pull plows and harrows. The twelve Division Engineers in the Highway Department were instructed to cooperate in this novel but effective method of relieving the acute farm situation. Over 175 pieces of tractor equipment, with several hundred skilled men to operate them night and day, were made available for farm work. Ohio is believed to be the first state in the country to step into the breach and help the farmer overcome what threatened to become a serious set-back in the Victory food program.

The tractors were rented to farmers at a nominal fee. The farmers paid the operators the same rate of wages that the Highway Department pays them. The farmers also provided gasoline and oil and other equipment necessary to the plowing and harrowing. The Highway Department transported the tractors from one county to another where necessary.

A committee of farmers in each county, set up through the county farm agent's office and Ohio State University College of Agriculture extension service, handled assignment of work and all other details.

Northern Ohio counties were the hardest hit, and they were the first to request use of the Highway Department's equipment. When the program was put into operation, 46 of the state's 88 counties had applications on file for use of the tractors. The plowing and harrowing problem was licked in fifteen days.

Post-War Road Bill Still in Conference

On June 8 the House of Representatives, by voice vote, passed HR-2798, making Federal-Aid funds available for post-war planning and amending the existing law so as to include rights-of-way as part of the cost of construction. This bill is a substitute for HR-2113, on which the Roads Committee recently held extensive hearings.

The measure provides for the inclusion of the costs of rights-of-way as "construction costs"; prevents the lapsing of Federal-Aid funds due to their unobligated status; provides a maximum of $50,000,000 of Federal-Aid funds for advance planning to be matched by the states on a 50-50 basis, an increase in the amount of funds available for access roads to sources of raw material from $10,000,000 to $25,000,000, and a survey of the need for a system of express highways to be made by the Commissioner of Public Roads.

The bill was immediately carried to the Senate, and then to conference. Final action has not yet been taken, but the unexpended balances of $69,000,000 of Federal-Aid funds will not lapse until sixty days after June 30. Therefore, if the bill becomes law before the end of August, these funds will be saved for the states.

In accordance with Government rulings to conserve paper, it has been necessary to limit the number of copies of each issue of CONTRACTORS AND ENGINEERS MONTHLY. *If members of your organization are not receiving copies regularly, we suggest you pass your copies along, when you have finished with them. "Share your copies" will help to conserve paper.*

MAINTENANCE
of your present equipment
IS IMPORTANT

SYNTRON

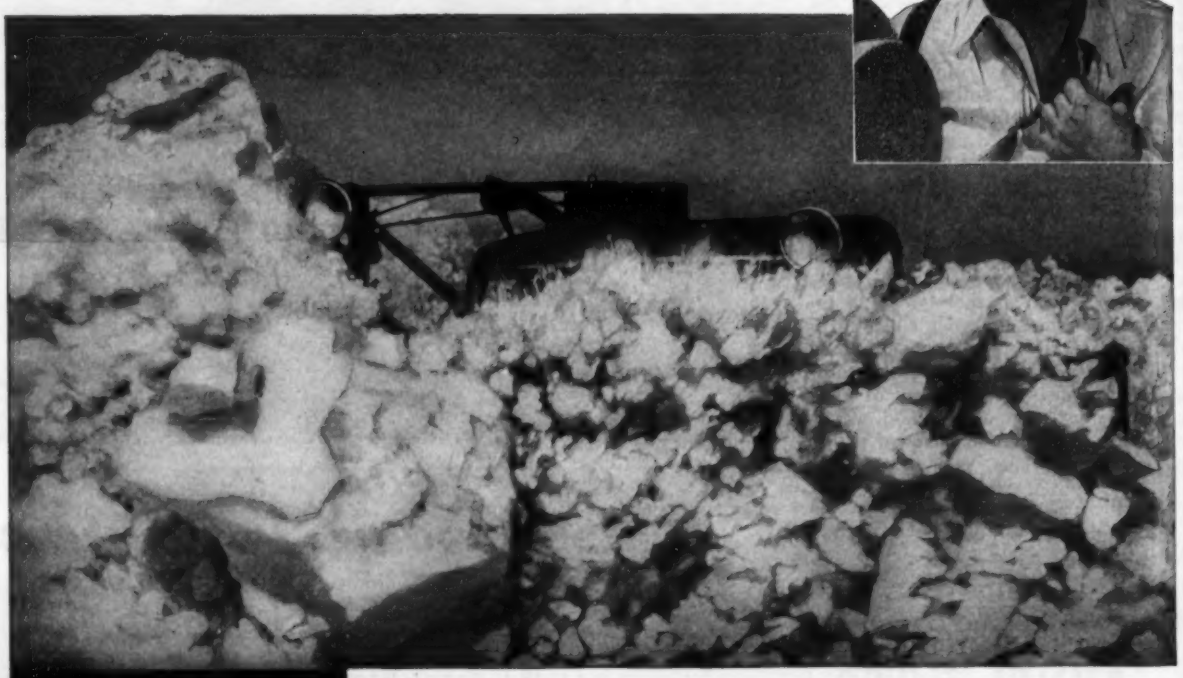
ELECTRIC HAMMERS

provide a *money, time* and *labor-saving* way of cleaning old, hard cement from mixers, chutes, etc. Also for scaling rust and paint from metal surfaces.

Write for your copy of Catalog No. 430.

SYNTRON COMPANY
227 Lexington Ave., Homer City, Pa.

90 Degrees in the Shade, Today ...but a BLIZZARD is on the WAY!



Walter Snow Fighters

WHILE you are mopping your brow, don't forget that within four months a blizzard can "turn on the heat" for your highway department.

Prepare now for the worst that winter can bring. Equip with Walter Snow Fighters—designed and built for snow removal. They have the super-traction of Walter Four Point Positive Drive, with the power proportioned to each wheel according to its traction by 3 patented Automatic Lock Differentials. This tremendous four-wheel power and traction enables Walter Snow Fighters to blast through towering drifts—to travel over icy surfaces—to keep going under conditions that stop other types of equipment.

It is none too soon to consider your next winter's snow removal equipment, in view of uncertainties in wartime delivery. Write for literature NOW, detailing the many advantages of Walter Snow Fighters. Get your order in early to insure readiness when the first snow flies.

WALTER MOTOR TRUCK CO., 1001-19 IRVING AVE., RIDGEWOOD, QUEENS, L. I., N. Y.

Planting Snow Fence In Snow-Belt States

Michigan and Minnesota Have Programs Which Help To Keep Highways Free of Drifting Snow

+ AS far back as 1926 an investigation was started in Michigan by the Civil Engineering Department and Engineering Experiment Station of Michigan State College to determine the effect of various types of barriers on snow drifting. This study included both artificial barriers and natural barriers such as grass, weeds, brush and embankments. In this same year, another investigation was made of snow control by tree planting.

Conifers and Deciduous Trees

In choosing a conifer or evergreen to be used as a snow barrier, it should be attractive, suitable to the locality where it is to be planted, and capable of making a good growth under local soil and climatic conditions. The ideal tree is symmetrical, with a dense compact crown and branches that reach to the ground. In its study of conifers by the Michigan Engineering Experiment Station, as reported in Bulletin No. 75, it was found that those most suitable for snow-control planting are the white pine, Austrian pine, jack pine, red pine, Scotch pine, Norway pine, Norway spruce, white spruce, black spruce, blue spruce, red spruce, balsam fir, white fir, Douglas fir, hemlock, northern white cedar and the eastern red cedar.

Deciduous trees and shrubs may be used for snow-control purposes where climatic conditions are too severe for the conifers. Care must be taken in choosing a tree which will resist drought and extreme cold. A deciduous tree suitable for planting in a snow barrier should develop a dense growth of branches extending from the base to the top. The branches should be strong, to withstand snow, wind and ice, and the tree should be capable of making rapid growth under adverse conditions. Trees planted for this purpose are not subject to natural pruning which takes place when planted in groups.

The deciduous trees and shrubs which have been used for wind or snow barriers, according to the Michigan report, are the following:

box elder	Russian mulberry
Northwest poplar	cottoneaster
Carolina poplar	cut-leaf elder
cottonwood	red currant
locust	buffalo berry
silver maple	Chinese elm
paper birch	Norway poplar
smooth sumac	laurel-leaf willow
Cistena	Osage orange
compass cherry	Russian olive
Caragana	European larch
green ash	wild currant
American elm	Persian lilac
golden willow	black currant
mulberry	Japanese privet
hackberry	chokecherry
butternut	

Methods of Tree Planting

There are two distinct methods of tree planting in Michigan: wide planting in multiple rows used when it is necessary to trap most of the snow within the barrier, and narrow planting in double rows which will cause a drift to form between the barrier and the traveled way.

The wide planting, or multiple-row barrier, consists of three or more rows of trees. The trees are staggered in the rows to increase the efficiency of the barrier and are usually spaced from 8 to 10 feet apart. The rows may vary from 5 to 15 feet apart. This type of planting is very flexible because the number of rows can be increased or decreased, depending on drift conditions and the available space for planting.

The double-row barrier, which consists of two rows of trees, is very efficient when the trees have reached their effective height and is best adapted to narrow rights-of-way. Also, since this type of planting is more open than the multiple-row barrier, a greater variety of trees can be planted. One common method of construction is to plant the trees close together at first and thin out the planting as it grows to maturity.

The single-row barrier usually consists of a dense growth of evergreens or a hedge of deciduous trees and shrubs. The single-row hedge is common along Michigan highways where it is sometimes planted on the right-of-way line

(*Concluded on page* 45)

Snow-barrier planting of white Scotch, Norway and Austrian pines on U. S. 131 near Cadillac, Michigan.

LESS WEAR HERE * * * MORE POWER HERE * * *

at the same time

RING-FREE REMOVES CARBON

This is no time to let carbon and unnecessary wear waste hard-to-replace parts... waste fuel ... waste productive horsepower. Lubricate your power plant more efficiently with Macmillan RING-FREE Motor Oil. By reducing friction *fast*, RING-FREE delivers direct to the driveshaft more of the horsepower ordinarily wasted in overcoming motor friction. And in addition, it actually removes carbon while the engine runs! Carbon removal is a natural RING-FREE function, inherent in the crude oil and retained by the exclusive Macmillan patented refining process. To remove carbon... to minimize "downtime"... to get maximum fuel conservation... and to get all-out performance — start using RING-FREE now!

Macmillan RING-FREE Motor Oil combines these vital qualities: **1**—Removes Carbon, **2**—Reduces Friction *Fast*, **3**—Saves Fuel, **4**—Has Great Film Strength, **5**—Has High Heat Resistance, **6**—Long Cling to Metal, **7**—Fast Penetration, **8**—Is Non-Corrosive, **9**—Is Less Affected By Dilution.

MACMILLAN PETROLEUM CORP.

50 W. 50th St., New York • 624 S. Michigan Ave., Chicago • 530 W. Sixth St., Los Angeles

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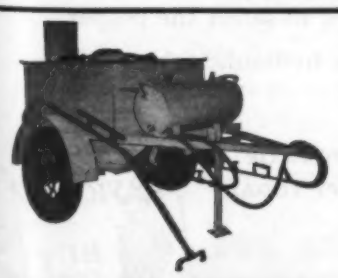
MACMILLAN RING-FREE MOTOR OIL

REDUCES WEAR BY REDUCING FRICTION



HEATING KETTLES

Fire Proof—Oil Burning

Hand and Motor driven spray. Many sizes. Write for catalog.

White Mfg. Co.

ELKHART INDIANA

Truck Mixers Supply Concrete on CWS Job

(*Continued from page 9*)

Batching for Truck Mixers

The Lima 660 crane for supplying aggregates from the stockpiles was set about 6 feet above ground level on the stockpiles so that its 50-foot boom would reach to the top of the aggregate bins above the batching plant. Equipped with an Owen 1½-yard clamshell, it was busy most of the working hours keeping up with the demands for aggregates for the truck mixers.

The batching plant was equipped with H. M. Hardy beam scales for the aggregates and gravity indicators for close weighing. One man on the batching platform handled the weighing of the aggregates and another operated the water-measuring tank. The batch weights, including the moisture, on the day of our inspection were: gravel, 8,174 pounds; sand, 4,990 pounds; water, 125 gallons; and cement 1,974 pounds. These weights were for a 4-yard batch.

The fleet of truck mixers consisted of two 2-yard Rex and three 2-yard Blaw-Knox Truk-Mixers, three Jaeger 2-yard and nine Jaeger 4-yard Transit-Mixers. The trucks stopped ahead of the batching plant to refill their wash-water tanks and then drove through under the plant, spotting the truck according to indicators at the side for the various types of trucks. The aggregates and water for the batch were shot into the drums at the same time and then the truck drove forward to the cement batching plant about 200 feet away.

A screw from the cement silo to the cement batching hopper on a very flat grade was actuated automatically by a push-button control. The batch man pushed the button and the screw started operation, delivering the cement to the hopper. As the duplicate hand on the back of the Kron scales passed the point for cut-off, it made an electrical contact that shut off the spiral conveyor. There was some slight overrun on a few of the batches but this was not common.

After the trucks had taken on their cement, they drove forward again and stopped at an elevated platform where a man put on the hatches of the drums for those trucks so built.

Pouring Warehouse Foundation

At the time of our visit the trucks were delivering concrete to the foundation of a warehouse. One of the largest pours in the entire project was a slab 6 inches thick and measuring 600 feet long and 100 feet wide for the floor of one of the larger warehouses.

The trucks delivering concrete for the warehouse foundation ran close to the skip of a Mixermobile and filled the skip with the mixed concrete. Then the skip was raised and dumped into the mixing drum of the Mixermobile. The concrete was then delivered as needed to the ½-yard bucket in an elevator at the front and raised to dump into an Insley buggy hopper set at the level of the runway. Thus the Mixermobile skip, drum, ½-yard elevator bucket and buggy hopper all acted as storage for concrete for the forms, while the drum served to provide further agitation for the batch.

The concrete crew used seven Kilbourne & Jacobs rubber-tired concrete buggies on the long runway. The concrete was poured into the foundation wall forms and vibrated by a White portable vibrator driven by a Wisconsin engine, the entire unit being easily moved on its wheel along the runway as required. The walls were all made with Economy steel forms leased by the producer and maintained by him at the site. The contractor set the forms and stripped them at the proper time, while the lessor cleaned and repaired the forms and delivered them to the site for further use.

Personnel

The construction of the warehouses and other structures required at this Chemical Warfare Service Arsenal was done by contract under the direction of the U.S. Engineer Corps.

Future Universal Joints

A new catalog and handbook which presents for the first time a universal joint which operates effectively at angles from 0 to 360 degrees in any plane has just been published by Brooks Equipment Corp., 90 West St., New York City, N. Y. The growing use of flexible joints has increased the demand for new and better designs of remote mechanical control and shaft assemblies. Engineers, draftsmen, installation specialists, and users of flexible joints have often felt themselves hampered by the limitations of knuckle-type universal joints at angles from 15 degrees and bevel and mitre gears.

This new book covers the problems of remote control, universal joints, shaft joints, shaft couplings, shaft hangers, shaft assemblies, hinged joints, universal joint covers, shaft expansion couplings, operating gears, engine controls, steering controls, valve controls, and ventilation controls.

Copies may be secured direct from the Brooks Equipment Corp. by those writing direct on their business letterhead and stating their need for information on this new type of equipment which includes the consolidated hinged joint and the new Brooks universal joint.

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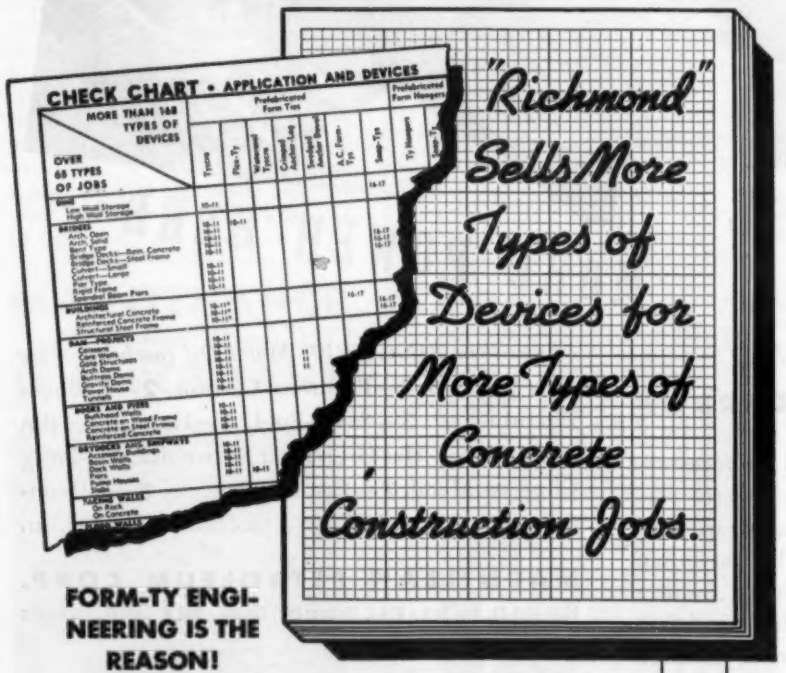
FORM-TY ENGINEERING FACTS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Giving Longer Life To Engine Bearings

A very complete and helpful article, "How to Increase Automotive Engine Bearing Life," appears in No. 4 of Volume 29 of *Lubrication*, published by The Texas Co., 135 East 42nd St., New York 17, N.Y. This 12-page article discusses the development of today's precision-type bearings and then the reasons for failures and the precautions which can be taken easily to avoid these troubles. Two pages devoted to "things to watch" when installing bearings are particularly helpful to the shop man. The article is illustrated so that the theory of lubrication is shown in a practical manner.

Copies of this issue of *Lubrication* may be secured direct from The Texas Co. by mentioning this item.

Studies in Arc Welding

A 1,200-page book containing ninety-eight of the outstanding award studies submitted in the James F. Lincoln Arc Welding Foundation 1940-1942 Industrial Progress Award Program is soon to be made available. This volume, entitled "Studies in Arc Welding", will contain the accumulated knowledge and experience of more than 100 engineers, designers, and others applying themselves individually to a specific design study involving arc-welded construction.

While the vast majority of the studies to be published involve products of plants engaged in war production, the principles and practices reported in the individual papers will be of inestimable value in post-war uses of the arc-welding process in many fields of design, manufacture, and construction.

The book is being edited by A. F. Davis, Secretary, and Ed C. Powers, Assistant Secretary, of the Foundation, and may be secured from the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio. Price $1.50, postage prepaid anywhere in U.S.A. $2.00 elsewhere.

Connecticut Passes Anti-Diversion Bill

The Connecticut House of Representatives on May 5 rejected the proposal for an anti-diversion amendment to the State Constitution to safeguard highway funds. The bill was brought up for reconsideration on May 6 and was placed on the House calendar for May 11, when it was passed by a large majority.

The bill must now be brought up again at the 1945 session of the State Legislature, when a two-thirds vote of both the House and the Senate will be required before the bill can be submitted to the people for a referendum.

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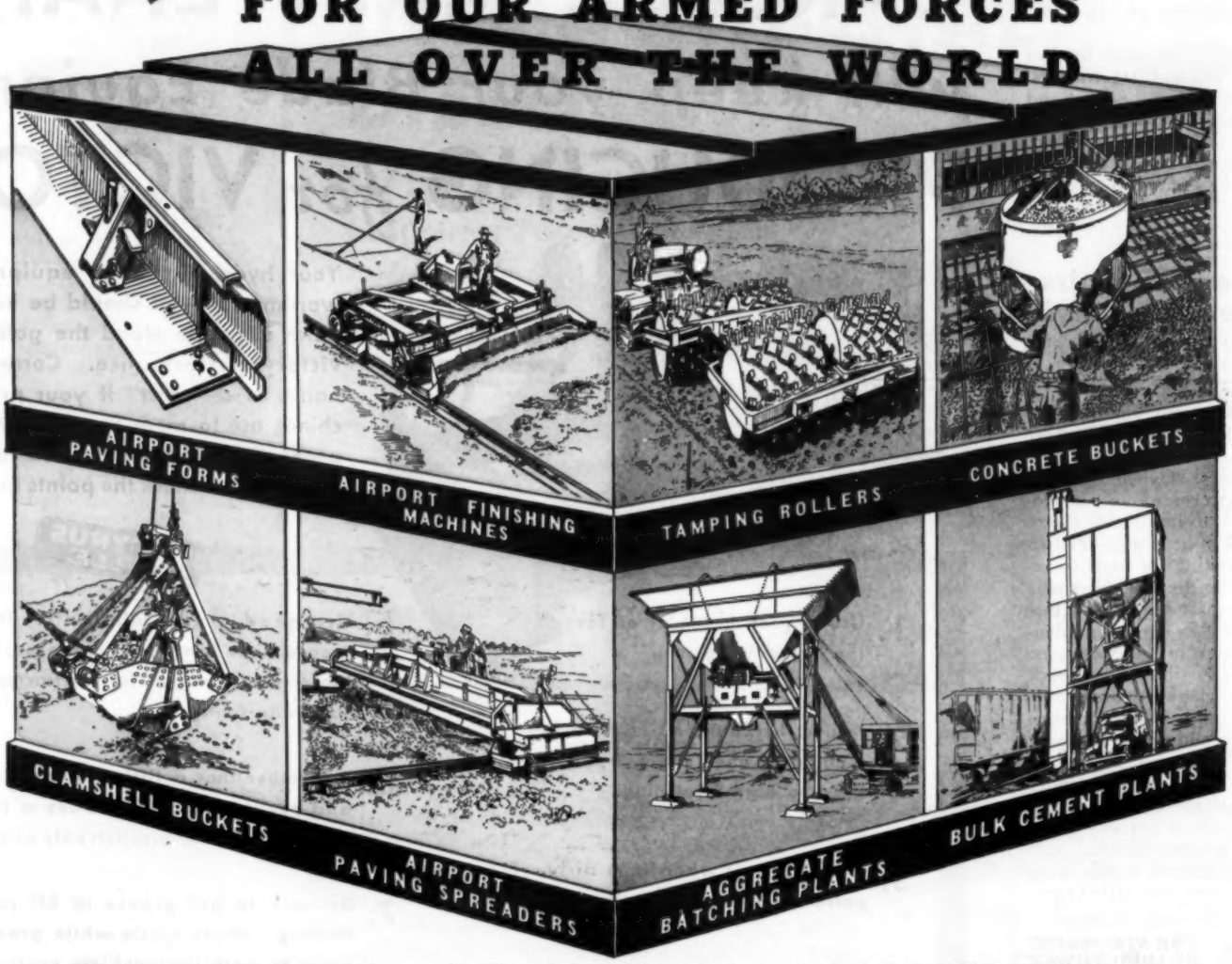

We place great value on the good will and friendship of our customers and distributors. It is our desire to supply their equipment requirements as far as we possibly can — but in all our hearts minds and activities the winning of the war takes precedence — so the production of Blaw-Knox Construction Equipment is earmarked "first for our armed forces."

We have planned to have some units of the above equipment available for shipment to domestic users on essential military projects. An inquiry to your nearest Blaw-Knox Distributor will develop whether we can make shipment and when.

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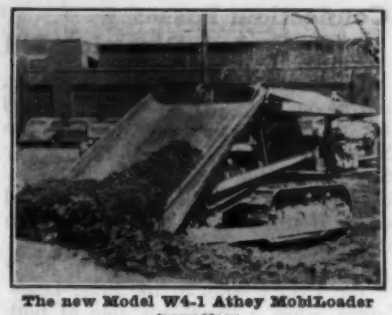

The new Model W4-1 Athey MobiLoader in action.

New Bucket Loader Is Mounted on D4's

An improved model of the Athey MobiLoader, which is mounted on a Caterpillar D4 tractor, has been announced by Athey Truss Wheel Co., 5631 West 65th St., Chicago, Ill. The major change is simplicity in design, although the manufacturer states that there are numerous improvements over the first model, which has been in the field for four years. The new model has increased stability, greater operating range, reduced height to simplify transportation, and a lower center of gravity. It has a bucket capacity of 1⅛ cubic yards.

Athey MobiLoaders are made in sizes to fit Caterpillar D8 and D4 tractors. The outfit digs the load at the front and then travels in reverse to the truck or fill and discharges the material overhead.

Complete information on the new model W4-1 may be secured direct from the manufacturer by mentioning this item.

Making Needed Repairs Front-Line Jungle Style

We are indebted for the following bit of news from the front to Edward J. Tuckett, Shipfitter, First Class, U. S. Navy, with the Fleet somewhere in the Pacific, through the courtesy of *Hobart Arc Welding News.*

Mr. Tuckett writes, "Out here on the other side of the world where replacement parts are next to impossible to get and equipment might be tied up for two or three months waiting for parts to arrive, we fully realize the valuable assets we have in our Hobart gasoline-engine-driven arc welders. We encounter plenty of jobs that, back in the States, we would consider impossible to put back into shape, but somehow we discover some way of repairing a broken or worn piece of equipment and soon it is ready for duty again. When you understand thoroughly the circumstances under which we work and some of the things we have to work with, it is really unbelievable the work we accomplish.

"While on one of our repair trips through the jungle, we were called upon to rebuild five teeth that had been sheared off of a small gear on a commutator shaft. Unable to remove the shaft, we wrapped the commutator with sheet asbestos to protect it during the welding. We then discovered that we didn't have any welding rods to do the job with, so I set the welding machine reverse polarity and used bare steel rods to build up the teeth. As these teeth were too soft to last long, we dressed them with a file and then welded a small bead of Stellite on the surface. 'Believe it or not,' it works perfectly, and the entire job was accomplished in 3 hours."

Volume of Construction To Meet Needs of Army

Colonel Enoch R. Needles, Engineer Corps, U. S. Army, speaking at the Contractor's Dinner of the American Road Builders' Association in Chicago, stated that the U. S. Engineer Department in 1942 completed $5,417,000,000 of construction, which included Ordnance Department arsenals and chemical warfare plants, airplane plants, camps, and airports. He expects that the 1943 construction will probably be about 30 per cent of 1942 construction.

In 1941 and 1942 the War Department took over a large volume of heavy construction equipment by outright purchase and through accrued rentals, similar to installment buying, in order to create a pool which could be manipulated by the War Department and sent wherever needed. The present program of the Engineer Corps, U. S. Army, is to dispose of excess equipment and to redistribute it to troop use.

Most of the 1943 construction program will be done by privately owned construction equipment. Within six months it is expected that the Construction Division of the Army will be out of the equipment business. At present it is acquiring as little equipment as possible.

"For Want of a Repair Part—The Road was Closed"

Place your Repair Orders Early for

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Where communication is important DON'T LET SNOW BREAK THE CONTACT. Be ready. Order early. Arrange for the necessary priorities and be prepared for FASTER • SAFER • CLEANER Snow Removal with Davenport-Frink Sno-Plows.

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Your hydraulic blade equipment is a wartime tool—it should be kept in top-notch shape to stand the gaff of 3-shift victory performance. Correct maintenance is a "must" if your present machines are to meet the greatly increased production schedules called for by wartime needs. Check the points listed below.

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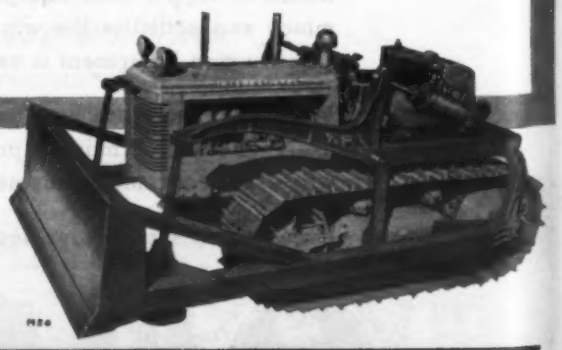
1. Use a good grade of oil for the hydraulic system.
2. Inspect hydraulic oil level at beginning of each shift. Keep supply tank filled to high-level plug.
3. Drain the oil when it is dirty. Floating particles wear pump and valve.
4. Inspect threads of all pipe and fittings when exposed. Rethread or replace any parts having worn, burred or rusted surfaces.
5. Use good grade lubricants. The same grease (lime-base chassis grease) used in the small hand gun for the tractor is used for blade fittings.
6. Remember that a little lubricant carefully and regularly applied does a lot more good than over-lubrication only on occasion.
7. Be sure to get grease to all points of bearing. Move blade while greasing in order to work lubricant into entire bearing area.



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STANDING ROOM ONLY FOR DURATION

Beebe Bros. All-Steel Hand Hoists carry the highest resale value of any piece of equipment in the world. If you have one not in use, sell it. Many more than are available are urgently needed in the win-the-war program. Thanks.

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Plant and Road-Mix For Idaho Highways

Asphalt Mileage Extended In Recent Years; Soil Study Determines Depth of the Crushed-Stone Base

✦ SINCE the nearest points from which asphalt may come for use on the roads of Idaho are in Montana and Utah, where refineries are located, thus resulting in long hauls, the cost of asphalt-surfaced roads is higher than in surrounding states. The Federal and state-system mileage totals 4,876 miles, of which 2,761 miles or 56.6 per cent are oiled; 1,076 miles, 22 per cent, are graveled; 131 miles have an asphaltic-concrete surface; and 83 miles are paved with portland-cement concrete. There are no other types of improved road surfaces used in Idaho.

Every endeavor has been made in the past few years to extend the mileage of plant-mix and road-mix surface. Very careful specifications have been prepared and the work that has been done has been of a high order. The methods employed are described in the paragraphs below, resulting from an interview with Roy T. Gartner, Office Engineer, Idaho Bureau of Highways.

Plant-Mix Methods

After a complete soil survey of the road to be surfaced, a crushed gravel or rock base ranging from 6 to 18 inches thick is placed on the roadway. If a base deeper than 6 inches is used, it is usually of pit-run gravel or crushed rock with maximum 3-inch stone, while the 6-inch base is of crushed gravel or rock with a maximum of ¾ to 1-inch stone. This base is thoroughly rolled to compaction by an 8 to 10-ton 3-wheel roller.

For construction on the strategic network, where the road is 38 to 40 feet wide shoulder-to-shoulder, the black top is spread 22 to 24 feet wide. The base is primed 1 foot or more in width than the mat on each side with approximately 0.3 gallon per square yard of SC-1 or MC-1, usually the latter. The application is increased slightly if the base is open in character.

For the 2½-inch compacted mat of plant-mix material, the gradation of the aggregate is as follows:

	⅝-inch
Maximum screen size	
Passing ¼-inch screen	45-65 per cent
Passing 10-mesh	25-45 per cent
200-mesh component	not over 12 per cent

The asphalt, an SC-6 on recent projects, is from 3 to 4.5 per cent of the mix by weight. After the aggregates and asphalt are weighed for each batch, they are mixed in standard pugmill mixing plants. The mixing time is specified at not less than 30 seconds or until the aggregates are fully coated with the bituminous binder. The mix is spread by machine-type mechanical spreaders that finish the mat and then it is rolled by 8 to 10-ton steel wheel rollers.

As the detours are few, the road is done one-half at a time to accommodate the traffic on the second half. Usually the road is sealed the same year it is laid, using RC-4 or MC-4 at the rate of 0.25 gallon per square yard and approximately 25 pounds per square yard of an aggregate 100 per cent of which will pass a ½-inch screen, with not over 6 per cent passing a 10-mesh sieve and not over 3 per cent passing a 200-mesh sieve. Various types of spreader boxes are used for the uniform distribution of the chips over the seal coat.

Road-Mix Operations

With the base prepared as for the plant-mix surfacing, it is primed 1 foot wider than the mat on each side so as to protect the materials used for the road-mix from added material which might be picked up at the sides of the road by the mixing blades. The prime is an SC-1 applied at the rate of 0.3 gallon per square yard before the material for the mat is windrowed, in sufficient quantity for a 2½-inch mat, down the center of the road. Then SC-3 asphalt is applied in successive shots of not less than 1/16 nor more than ¼ gallon per square yard up to a total of 3 to 4.5 per cent by weight of the aggregate. Between the application of the asphalt in the successive shots, the aggregate and the bituminous material are mixed by blades. On some projects, standard traveling mixers such as Barber-Greenes or Woods have been used. The jobs which have been done in Idaho have been divided about equally between the two methods of mixing. The completion of the work as far as rolling and the seal are concerned is the same as for the plant-mix jobs.

New Belting Sales Mgr.

The United States Rubber Co., New York City, has announced the appointment of George C. Crabtree as Manager of Belting Sales. Mr. Crabtree has been with the company since 1922.

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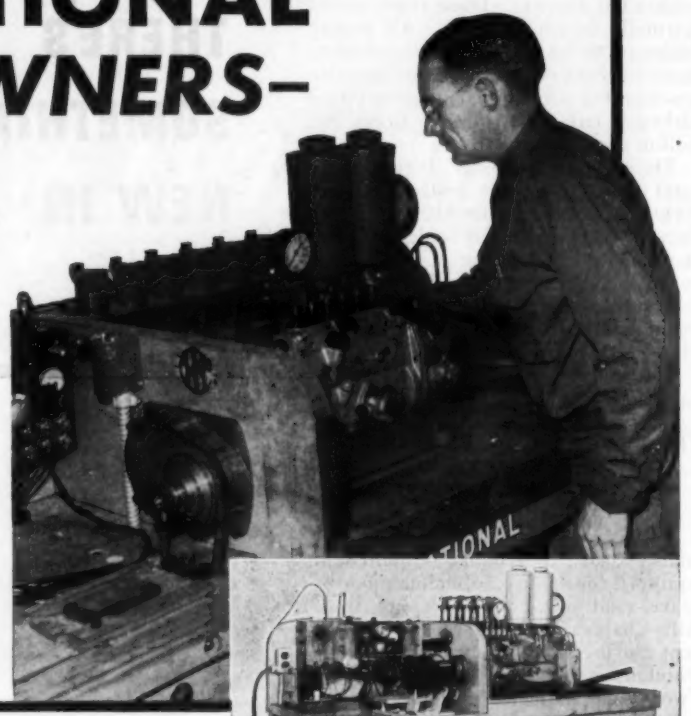

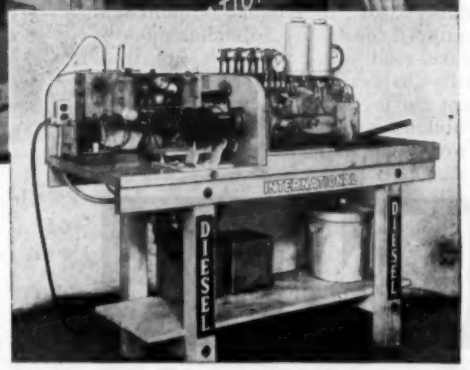

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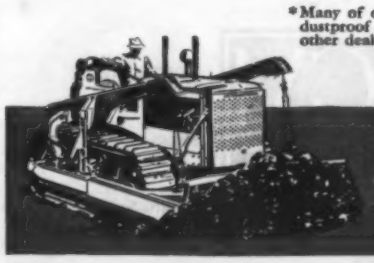

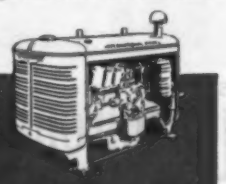

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Small County Budget But Good Gravel Roads

(*Continued from page* 1)

might be disheartened. That was the initial information gleaned from F. E. Ross, County Engineer of Cole County, Jefferson City, Mo., when we caught him at the Union Bus Station in Missouri's capital city. A few minutes later we were starting a half-day tour of county roads and bridges running down: 1. How can the county do all it does with such a small highway budget? 2. Why are there no washboards on Cole County gravel roads? 3. How can a county build 20, 25, 30, 35, 40 and 50-foot-span concrete bridges with no carpenters, and with only one set of forms?

Organization and Finances

The reason for the relatively small mileage of county roads is that there are three Special Road Districts, including one at Jefferson City with about 60 miles of road, which have their own equipment, assess separate taxes, and handle everything to do with the roads within the districts. These roads would normally be county roads. All county highway money comes from real-estate taxes as there is no division of the state gasoline tax with the counties or cities, although cities may levy a 1-cent per gallon gasoline tax.

The County Highway Department's total road and bridge budget is about $34,000, of which about $12,000 is produced by the road and bridge tax and the balance is taken out of the general revenue. At the end of each year, there is a surplus in the county general revenue, part of which is used to purchase all necessary county road equipment.

The county elects a County Surveyor for a four-year term and he automatically becomes County Highway Engineer. The present incumbent, F. E. Ross, has held the office for the past seven years.

County Road Equipment

With the relatively small mileage of county roads, the county is quite well equipped for the task of maintaining the gravel-road mileage. There are three Allis-Chalmers power graders which are kept moving about the county, each one maintaining about 100 miles of road. Two Allis-Chalmers tractors, one an HD-10 and the other an LO, are used to pull a Galion hydraulic-control grader and a 5-yard Continental scraper for fills and bridge-approach work.

For the surfacing of the gravel roads, about 36,000 cubic yards of new gravel is placed every year. This is excavated by a Bucyrus-Erie 10-B dragline, which loads as much as 400 yards a day, and by a 2-drum drag bucket in the river. The dragline is operated on small creeks where bars of gravel are found, and the drag bucket on the Osage River. An Allis-Chalmers engine and a CMC 2-drum hoist are mounted on a trailer and with a run of about 250 feet of cable between the hoist and the sheave the hoist pulls the drag bucket back and forth across the river and hauls the gravel onto a ramp from which it drops into the trucks. The sheave is fastened by an 800-foot cable to some tree on the far side of the river and is moved as the gravel in the immediate section is exhausted. In order to extend the service of the Bucyrus-Erie dragline the county purchased a trailer that can be towed, with the dragline aboard, at 30 miles per hour from one part of the county to another so that it can work at two or more locations at opposite corners of the county within one working day.

The county fleet of eight 2 and 3-yard trucks includes one GMC and one International truck. The balance of the trucks are Fords. The 3-yard trucks are equipped with special axles for heavy service. A Topeka highway mower keeps the roadsides free of high weeds by cutting both sides of some 20 miles of highway each day during the growing season.

Gravel Roads—No Washboards

Cole County gravel roads are free of washboards—a miracle to some folks engaged in the gravel-road field. Mr. Ross admits that he has no perfected formula for this but that he is convinced that the lack of sand in the gravel used for the surfacing of Cole County roads accounts for the condition. He has dug into washboards on many county roads in other states and counties and reports invariably finding an excess of sand in the "rib" of every washboard. Cole County roads are well packed and with a minimum of loose gravel. The small amount of top soil permitted in the roads acts as a satisfactory binder for the gravel and stabilizes the surface. Of course they are dusty in dry weather, but that is something that you have to put up with when the roads are of this character. Mr. Ross prides himself rightly that the roads are "all-weather" roads and are usable every day of the year, wet or dry, unless the river comes up and floods them out for a matter of a few hours. There are flashy streams in Cole County which do this each year so the bridges are built clear of high water, but there is invariably a section of the highway near the approach to the bridge that is left low as an overflow to relieve the stream and let it run out over the bottom lands for the short period of high water.

Most of the right-of-way in Cole County is only 30 feet wide with 18-foot gravel-surface roads, allowing only 6

(*Concluded on next page*)

UNION

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Union Iron Works, Inc.
ELIZABETH, New Jersey

THERE'S SOMETHING NEW IN THE PICTURE

The "Best Friend of Charleston" was the first locomotive entirely built in this country—for the South Carolina Railroad, now part of the Southern Railway System.

Daily movement of a staggering quantity of oil from New Orleans to the Eastern States is the No. 1 war job of the Southern Railway. The Southern assigns its fleet of General Motors Diesel freight locomotives as the key motive power to expedite this important flow.

Reconstruction and new construction are going to need plenty of this hard-hitting, easy-on-the-fuel power. With normal refinement and development speeded up by war, with production expanded, GM Diesels will be ready to serve in more fields and in more ways than ever.

OUT of every war has grown a new era in transportation. This one is no exception. The pattern of that new era had been set, even before this war, by the General Motors Diesel Locomotive. And its Leadership in the Peace to come is forecast in the way this locomotive is today meeting the challenges of war.

GM
GENERAL MOTORS
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LOCOMOTIVES.....ELECTRO-MOTIVE DIVISION, La Grange, Ill.
ENGINES...150 to 3000 H.P....CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio
ENGINES.....43 to 250 H.P.....DETROIT DIESEL ENGINE DIVISION, Detroit, Mich.

Novel Forms Build Cole County Bridges

(*Continued from preceding page*)

feet on either side for the shoulder, ditch and backslope. Ninety-seven per cent of all the roads in Cole County are all-weather roads. They average 600 cubic yards of gravel per mile for surfacing.

Steel Bridge Forms

At the expenditure of considerable thought and mental energy and a cash outlay of $600, Cole County has a unique set of steel forms for bridge construction. The forms were designed by Mr. Ross for multiples of 5 feet in the lengths of spans up to 30 feet and use the same depth of beam for the various spans, merely varying the amount of steel for reinforcing. This, off-hand, sounds uneconomical but when the conditions of county bridge construction are taken into consideration there are many very real economies. In the first place, the labor used for concrete bridge construction in the county does not include any carpenters and yet very creditable work has been done with the steel forms where it was impossible even to consider the use of wood forms. By wasting a little concrete in short spans, there is a considerable saving in the forms themselves, particularly when the use of lumber is considered.

The steel forms are made up of angles and plates, all welded, with a standard form for the bottom of the beam, and two standards for the sides. One set is used only for the inside beams and one other set only for the outside of the outer beams. These have a clip welded to the outside for a 2 x 4 to be slipped in to hold the hand-rail forms. The county has enough of these steel forms, made especially for it, to cast four 30-foot beams, so when they are used for 50-foot beams only two may be cast at a time. In this case it was considered better to make the beam deeper than to try to use the total amount of steel that the shallower beam would require. This led to changing the standard 17-inch square beams to 17 inches wide and 21 inches deep by building up the top of the form with a 2 x 4 so that with the 6-inch floor the beam was actually 27 inches deep.

Channel lugs on the sides of the forms are used to hold 4 x 4-inch timber which may be pushed out at the ends and thus extend the span of the form with wood forms nailed to the extended 4 x 4's. A similar method is used when the bridge is on a skew by extending one side to make the angle and holding the other side to the standard 5-foot units. The floor forms are held in place without nailing by channels welded 2 inches below the tops of the side forms for the beams so that 2 x 6-inch or 2 by any width lumber may be cut, laid on the channels, and covered with roofing paper to make the removal of the form lumber easy after the curing period. The outside forms have holes in them so that the outer form may be tied to the inner form because of the chance of spreading without the support that is secured by the floor forms for the inner beam forms.

These forms have been used twelve times for bridge construction in Cole County and have saved at least five times their cost in form lumber alone, to say nothing of the fact that the bridges could not have been built with the labor available for the WPA projects, had the steel forms not been available. The latest bridge to be completed, and the most ambitious of the entire group, was opened September 18, 1942. This bridge over the Moreau River has a 22-foot roadway and is 190 feet long. There are two 30-foot spans at one end and one at the other and two 50-foot spans in the middle. It is located 2 miles south of Centertown, which is nearly the center of the state of Missouri. The piers are built on rock and the center pier, which is 38 feet from rock to the bottom of the beams, rises 5 feet above the maximum flood recorded. On the 50-foot spans the girders are 21 inches deep, using five per span, and for the 30-foot spans there are four girders 17 inches square.

New Sealing Compound For Hot Poured Joints

A wartime substitute for Para-Plastic, a hot poured rubber sealing and waterproofing compound, has been developed with non-critical materials by the Servicised Products Corp., 6051 W. 65th St., Chicago, Ill. While the new Para-Plastic contains no rubber, its sealing qualities conform to Federal specifications SS-F-336 covering a hot poured sealing compound, as well as Civil Aeronautics Association Specification No. P-605.

This new plastic seal bonds firmly with concrete, steel, or wood, and serves as a joint or crevice sealer against infiltration of water or any other foreign matter. The producer points out that this material will extend to several times its original thickness and still maintain a perfect seal and it is not affected by ordinary extremes of summer or winter weather.

Samples and specifications of the new non-critical-material Para-Plastic, which has been used on airport runways, dams, highways, tunnels, reservoirs, and similar projects all over the country, may be secured without obligation direct from the manufacturer.

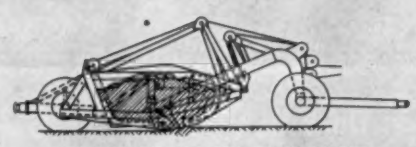
New Electrode Chart

A new electrode comparison chart recently published by the Air Reduction Co. is designed to simplify the purchase of competitive welding electrodes. The chart gives details of the principal AWS and ASTM electrode classifications and indicates which electrodes produced by twenty leading manufacturers meet the different requirements.

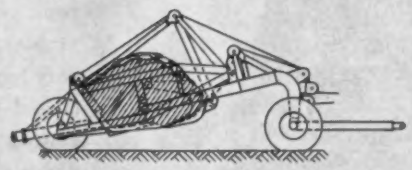
The electrode purchaser can use this chart to determine what brands of electrodes fall within a specified AWS or ASTM category, as well as learn what alternate brands might be used successfully should a specified electrode not be available.

Free copies of this helpful chart may be secured by writing to Mr. G. Van Alstyne, Air Reduction Co., 60 East 42nd St., New York City.

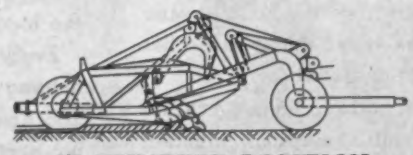
LESS POWER TO LOAD



(1) LOADING POSITION



(2) CARRYING POSITION



(3) DUMPING POSITION

GW Cable-Controlled Scrapers provide three ways to speed-up earth moving, do the job in shorter time—and "clear the way" to Victory!

Illustrations, left, show the loading, carrying and dumping positions. When loading (1) the line of draft is located to prevent the cutting edge from being pulled out of the ground. Weight is evenly distributed. Boiling action of dirt, loads the bowl and gate with a minimum interference of the material already loaded. In the carrying position (2) the high center clearance of the cutting edge is ideal over soft or uneven ground.

Front portion of load dumps (3) by raising the apron. Remainder of the load is forced out efficiently by *positive rolling ejection*, as the bottom of the bowl reaches a steep angle, resulting in less cable wear. Wide space between cutting edge and apron permits dumping large sticky loads without interference. The cutting edge remains fixed while dumping, thus providing accurate control of depth of spread.

The GW Road Machinery line is complete—consisting of both Hydraulic and Cable-Operated Units.

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Two Hot-Mix Plants At Southwest Airfield

(*Continued from page 2*)

planes. For this reason the tack coat of the shoulders was abandoned, and seeding used to bind the soil and to control dust and erosion.

The drainage ditches for the runways are located at the edge of the stabilized shoulders, with the invert 3 feet 9 inches below the crown of the runways.

Aggregate Problem

A study of the local aggregates for use in the hot-mix asphaltic-concrete course revealed a deficiency in fines, a condition usual in this area. There was also a deficiency in aggregate larger than ¼ inch. In order to obtain the proper gradation, mill tailings were hauled 9 miles to provide the required fines, and coarse aggregate was delivered from a distance of 40 miles by rail.

Due to the excessive cost, only a small portion of coarse aggregate was added to the material for the 4-inch base course. This resulted in a somewhat finer gradation of base-course material than is usually used in this area. This gradation is, however, larger than that used in a great many other areas and with careful control, a strong stable base course was obtained. Mill tailings were also added to this material to provide the necessary fines.

Traveling-Plant-Mixed Base

Material for the 4-inch base course, consisting of two 2-inch layers, was mixed in place by Barber-Greene traveling mixers, using four windrows for the 150 feet width. From 4 to 5 per cent of the MC-3 or MC-4 oil was used. The percentage and type of oil was varied as required.

Hot Plant-Mixed Surface Course

The material for the 2-inch surface course of asphaltic concrete was mixed in two separate Madsen asphalt plants. The asphalt for the two plants was delivered in tank cars ¼ mile away and four shuttle trucks of 1,000 to 1,500-gallons capacity hauled the material to one plant. A single 2,500-gallon tank truck was used for hauling to the larger plant. Both plants are rated at 3,000-pounds per batch, but the weights were varied according to the maximum amount of well-mixed material that could be delivered in one batch within the minimum mixing time specified. The minimum asphalt content of the batches was held to 4 per cent. The smaller of the plants had an initial production of 50 tons per hour which was boosted to 75 tons, while the larger plant held its production steadily to 100 tons per hour. The plants were normally run in two 10-hour shifts, from 4 a.m. to 2 p.m. and from 2 p.m. to midnight.

The smaller and older plant was distinguished by the drier being placed on top of the plant instead of at the conventional ground level. The aggregates were stockpiled behind the plant and the sand and gravel were fed to a short belt by a Caterpillar D8 with a LeTourneau bulldozer. Onto this belt, another belt at right angles fed the filler material, so that the materials were mixed as delivered to the boot of the cold elevator. The sand and aggregate belt was driven by an Allis-Chalmers electric motor, while the filler belt was driven by the engine from an old Buick automobile.

The drier at the top of the plant was 3 feet in diameter and 16 feet long. It delivered the dried aggregates to a rotary screen which removed oversize and dropped the balance of the aggregates into the hot bins. For batching, one man handled the aggregates and the asphalt as well as dropping the mixed batches into the hauling trucks.

For this plant there was a single 5,000-gallon asphalt-storage tank and one 4,000-gallon fuel-oil tank. The asphalt pump was mounted on top of the storage tank and pumped through a loop to the weigh bucket, maintaining a constant flow back to the storage tank. A 35-hp steam boiler, oil-fired, supplied steam for the operation of the reciprocating asphalt pump and to heat the storage tank as well as supply steam for the jacketed asphalt lines. It also operated the piston on the dumping gates of the pugmill. A Caterpillar D13,000 engine provided the power to drive the entire plant.

The larger plant was of a more conventional type but had several unusual features. One of these was the method of feeding the aggregates to the cold elevator. The stone, filler and sand for the mix were stockpiled over a tunnel behind the plant, with a hand-controlled gate beneath each pile of material. The various materials were separated by bulkheads in the stockpiles. The tunnel belt was 32 feet long and 30 inches wide and served directly to carry the sand from the back of the tunnel and the stone from the front of the elevator. The filler was fed onto a 6-foot belt placed closer to the control gate and then dropped onto the longer feed belt. In this manner the aggregates were metered quite effectively, in fact so well that the overflow chutes of the plant showed rust from lack of use. The speeds of the two belts were the answer to the proper proportioning and the uniform delivery of all of the aggregates to the hot bins.

The drier was 6 feet in diameter, 24 feet long and oil-fired. It emptied the

(*Concluded on next page*)

Ross Snow Plows

Snow plows will not be available except on high priority. Plows you now own should be put in good condition during the summer months and be ready for service next winter. Where new plows are necessary, effort should be made now to secure the proper authority to permit their being built.

ROSS SNOW PLOWS with their "Sno Flo" moldboards move more snow with less power.

Manufactured by

THE BURCH CORPORATION

Crestline, Ohio

Equipment since 1875

BUY WAR BONDS TODAY

A taut steel rope angles down into the boiling wake, so small in proportion to the vessel that it seems like a fishing line over the stern of a rowboat.

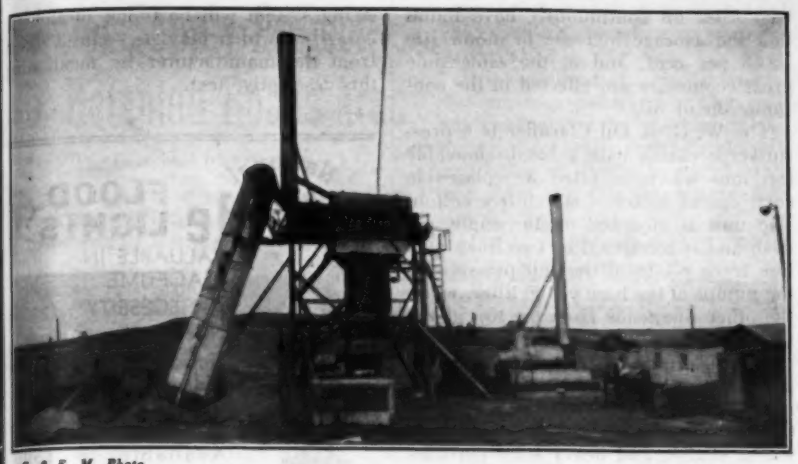
Far off over the rim of the horizon, there's a flicker of light followed by a sound like distant thunder. The steel rope jerks as if some huge sea monster were nibbling at it.

The steel line is not for fishing. It's a target-towing hawser. The distant thunder comes from the big guns of a battleship. The "nibbling" is the impact of heavy shells upon the target.

Naval target-towing hawser is one of the many special war ropes now being produced by Bethlehem Steel Company. Because of its great length, this rope must be light yet incredibly strong. It must also resist corrosion by sea water. To solve this particular problem, Bethlehem developed steel rope wire with very high strength and shock resistance. This wire is coated by the exclusive bethanizing process. Bethanizing is an electrolytic coating process which produces the purest, tightest, most uniform zinc armor ever applied to rope wire, and yet does not reduce the toughness or fatigue-resistance of the wire.

Every foot of wire rope made by Bethlehem is helping in some way to win the war. We're working 168 hours a week to supply the battlefronts and yet not neglect the mines, quarries, mills, factories and dozens of other "musts" at home.

BETHLEHEM STEEL



C. & E. M. Photo
The older and smaller of the two Madsen hot-mix plants at an Inter-Mountain-State Air Base project.

Paving and Sealing Runways at Air Base

(Continued from preceding page)

dried aggregates into the hot elevator which raised them to a vibrating screen which was made up of ¼ and ¾-inch sections. An 85-hp steam boiler supplied steam for the asphalt lines and pump and for dumping the pugmill mixer. The batches totaled 3,000 pounds nominally but the weights of the aggregates and asphalt went beyond the specified weight of a single batch. Since the results were entirely satisfactory there was no censure. The batch consisted of approximately 1,700 pounds of sand and filler, 1,300 pounds of stone and 135 pounds of asphalt.

Two asphalt-storage tanks, each with a capacity of 5,000 gallons, were served by a Fairbanks-Morse asphalt pump which pumped from the delivery trucks to the storage tank and also from the storage tanks through a loop to the weigh bucket and back to storage. One man weighed the aggregates and asphalt, and, after the required 30-second mix, dumped the batches into the waiting trucks. Four batches were hauled per truck and a fleet of 7 to 20 trucks was kept busy. In spite of the long hauls there were no delays, one contributing factor being that the plant was so set up that the trucks could drive through under the plant, thus saving the time usually wasted, or requiring extra trucks, in backing around to get in under the plant for loading.

The plant was driven by a Caterpillar D13,000 power unit while a John Deere 50-hp engine drove the elevator and drier and a Ford motor furnished power for the conveyors. The man-power for the plant consisted of one foreman, one engineer, one fireman, an oiler, a mixer man, and two laborers, one of whom regulated the gates delivering the aggregates to the conveyors.

Laying the Surface Course

The top 2-inch layer of hot-mix was laid in 10 to 13-foot strips by a Jaeger Bituminous Paver with the foreman of the paving crew dumping hot-mix from the trucks into the hopper of the paver. The operator kept the line with the indicator on the front of the machine while the two wing men or rakers followed behind. The layer of hot-mix was rolled at once by a fleet of five 10-ton tandem rollers and two 3-wheel 12 to 15-ton rollers. After rolling and cross-rolling, the surface was checked repeatedly with a Bumpometer for smoothness, the specifications allowing only ¼-inch variation from a plane in 10 feet.

Seal Coat

The final operation completing the runways and taxiways for service was the sealing of the asphaltic-concrete pavement. After using RC-2 material on a portion of the work, it developed that RC-4 oil, applied at the rate of 0.25 gallon per square yard, gave better results. Cover aggregate, all passing the No. 4 sieve and not more than 5 per cent passing the No. 100 sieve, was used. Since the surfaces would not receive the sealing action such as usually results from highway traffic on a heavily traveled street where thousands of vehicles per day apply a rolling pressure to the surface, thus closing the voids against entry of moisture and deleterious matter, the runways and taxiways were heavily rolled after the cover aggregate was spread from an automatic spreader box at the rate of 20 pounds per square yard. After several days of rolling, alternated by leveling of the loose aggregate by means of a picket-fence drag operated rapidly over the surface, the excess cover material was swept beyond the edges of the pavement.

Personnel

The runway subgrade, road-mix base and hot-mix top operation at this inter-mountain-state air base were constructed by contract under the direction of the U. S. Engineer Department. In the interest of national security, the location of and mention of personnel connected with U. S. Army construction are omitted.

New LeTourneau Parts Chief

Gordon S. McKenty has been appointed General Parts Department Manager by R. G. LeTourneau, Inc., Peoria, Ill. Mr. McKenty, who will supervise parts sales, orders, and shipping activities, joined LeTourneau in 1935, and has served as a district representative, and at the Georgia and Vicksburg plants.

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La Crosse Makes Them Up To 200 Ton Capacity
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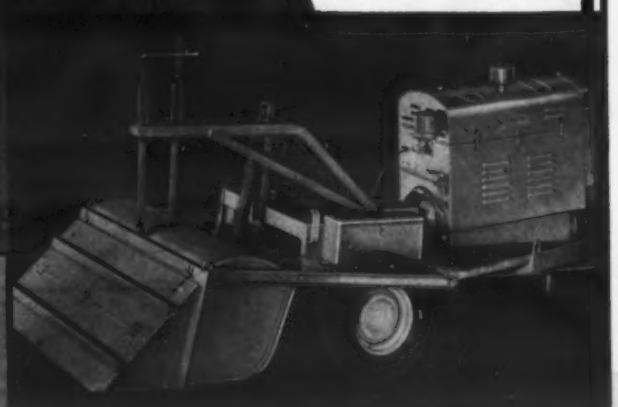
Pathway to TOKIO

Stabilized runways, temporary and permanent, will make our path to the streets of Tokio. And the SEAMAN MIXER,—because of its mobility, its thoroughness and high productive capacity will do its share in effecting a stronger, better and faster stabilization,—not only in airport construction but in building roads for troops and supplies. . . On the home front as well, whether it be stabilized streets at a defense housing project or runways at a training field,—the SEAMAN has eliminated uncertainties and variables encountered in the laborious conventional methods of in-place mixing.

"Every Soil Stabilization Job Needs a SEAMAN"

The SEAMAN PULVI MIXER

SEAMAN engineers have prepared a comprehensive report on Soil Stabilization Methods. Ask for Bulletin 22.



SEAMAN MOTORS
MILWAUKEE WISCONSIN

The New Garlinghouse Combination Shackle and Thimble

New Cable Fittings For Safe Connections

In an effort to overcome the problem of limited supply of standard shackles and thimbles for wire-rope connections, Garlinghouse Bros., 2416 East 16th St., Los Angeles, Calif., has developed a combination shackle and thimble known as the Gar-Bro Shimble. Made from structural-steel bars which are heated, bent and forged to shape, the Shimble is a safe and economical device which the manufacturer claims is safer than an ordinary shackle and gives greater protection to the wire rope than an extra heavy thimble.

These Shimbles are made with open and closed ends, in all standard sizes of wire rope, permitting a multitude of uses and safe connections. They are used wherever shackles or sockets are commonly used, such as guy anchorages, tractor hitches, crane slings, boom topping, etc., and they can be welded to other connections such as turnbuckles or plates.

Further information on these Gar-Bro Shimbles may be secured direct from the manufacturer by mentioning this item.

Filtering Engine Oils To Reduce Engine Wear

Fleet operators of heavy-duty motor trucks, which includes a large number of contractors and all of the county and state highway departments, as well as many Federal departments and Federal construction agencies, use various means to reduce engine wear and to get the most from lubricating oils.

An oil clarifier to filter the oil while it is circulating through the engine was developed by W. G. Burhans in the early 1920's. The W. G. B. Clarofier, as the unit is known today, clarifies the lubricating oil by continuous filtration on the running engine instead of frequent renewal of contaminated oil. The oil is made to pass through the long dimension of the filtering medium, a cartridge which is changeable without tools. Continuous filtration reduces engine wear by reducing abrasion, that is, by eliminating the metallic and carbon particles which scratch bearing and piston surfaces. Starting wear is reduced by removing the sludge and water which make cold oil sluggish. Oil-film rupture is reduced by keeping the oil clean and therefore more viscous. Acid erosion is reduced by continuous filtration by removing the water which combines with crankcase gases to increase the acidity of the oil.

W. G. B. Oil Clarifier, Inc., Kingston, New York, manufacturer of the Clarofier, states that prominent fleet owners who filter oil continuously have found that the average increase in motor life is 48 per cent, and at the same time great economies are effected in the consumption of oil.

The W. G. B. Oil Clarofier is a pressure-type casing with a hand-removable top into which is fitted a replaceable cartridge of bleached starch-free cotton. The unit is mounted on the engine or dash and is connected by two lines. One line feeds oil from the full pressure of the pumps at the base of the filter, while the other line leads from the top of the filter back into the crankcase. In operation, from 5 to 10 per cent of the oil pump capacity is fed to the Clarofier through its built-in metering hole, and this oil swirls into the filter base where water, sludge, and heavy solid particles settle out. From here it is forced through the porous filtering cartridge, where the cotton fibres strain out large particles and absorb fine colloidal material. Finally, the oil reaches the top outlet and is sent back to the crankcase.

Complete information on this oil-filtering system will be found in Bulletin No. 41-5, which may be secured direct from the manufacturer by mentioning this descriptive text.

National Carbide FLOOD LIGHTS

VALUABLE IN PEACETIME
A NECESSITY NOW

Simple in construction
Economical in cost
Dependable in operation
Available in 1500, 8,000 and 16,000-candlepower units

Write for literature showing complete lines of Floodlights and Lanterns.

NC-200

NATIONAL CARBIDE CORPORATION
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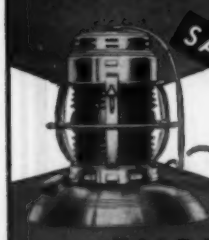
FOR GREATER *Highway Safety*
The New Warning Lantern with the SAFETY BEAM

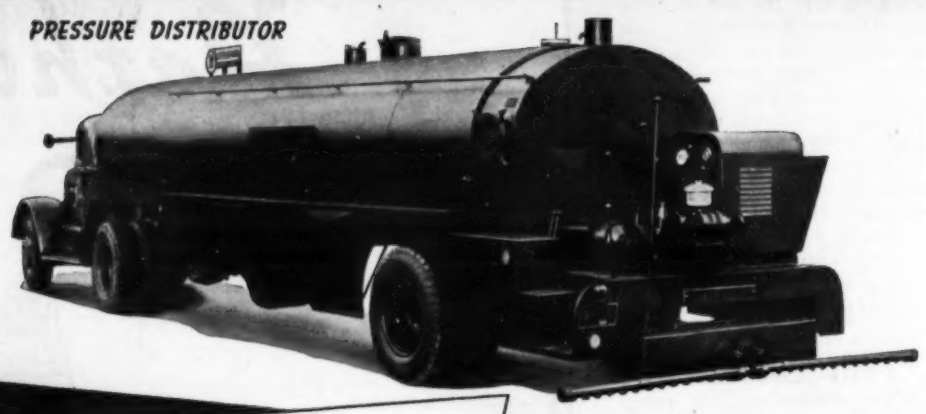


EMBURY *Traffic Guard*

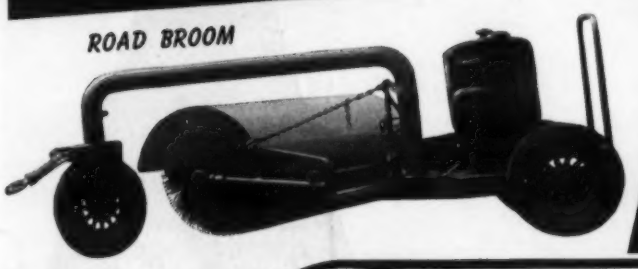
Here is a safety light that magnifies a tiny flame to beacon size. Sturdy, economical, leakproof, long-burning (up to 72 hours). Fresnal Ruby Safety Lens. Non-tipping base . . . The modern *warning* light.

Embury Mfg. Co., Warsaw, N.Y.

PRESSURE DISTRIBUTOR



ROAD BROOM



BLACK TOP ROAD MAINTENANCE EQUIPMENT
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SINCE - 1900
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TANKAR HEATER

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BLACK TOP ROAD MAINTENANCE EQUIPMENT

The Littleford Trade Mark is in the fight, building and maintaining Airports, Highways, Roads, Barracks and Cantonments. Doing a job to help bring an early peace. After Victory, the Littleford "Trade Mark" will again help to make this world a better place in which to live. Littleford since 1900, has produced Black Top Construction and Maintenance Equipment, and is NOW proud to have the chance to produce for Victory.

LITTLEFORD BROS., INC., 485 E. Pearl St., CINCINNATI, OHIO

Water-Supply Project In Hampton Roads Area

(*Continued from page* 13)

water in the rivers. Because of these conditions, piling was necessary to keep the pumping stations from sinking into the adjacent clay and mud, while the concrete box of the pumping station had to be made sufficiently heavy to overcome buoyancy.

The $2,000,000 Nottoway development is Federal-owned and includes the pipe line and two pumping stations for delivering 25 mgd to the system, giving a grand total of 52 mgd available for the Norfolk-Portsmouth area.

The complications on this development were somewhat less than on the northerly side of Hampton Roads because, as the project was instituted, the margin above immediate needs was somewhat larger and there have not been added to the area as many unexpected developments requiring additional water.

The Priorities Spiral

Inflation has nothing on priorities in its demands for higher and higher means to secure necessities. On this project no sooner had a priority been issued to enable the project to proceed than it became necessary to secure a higher priority because the priority inflation spiral had gone ahead so rapidly. The successive priorities under which this Hampton Roads area water-supply development has taken form started with A-3. It then rushed forward to A-1-c, A-1-a, AA-3 and is now being finished under AA-2-x and the CMP.

Personnel

The engineering design and supervision of construction for the Hampton Roads area water-supply projects have been under the personal direction of Reeves Newsom and E. H. Aldrich of Newsom & Aldrich, Engineer-Consultants, New York City and Williamsburg, Va. The Federal Works Agency engineers in the area are L. L. Pearsall, Principal Engineer, Blair Boyle, Project Engineer, J. W. Dotterer, Supervising Engineer, Jacob Wankmuller, Construction Engineer on the Chickahominy project, and J. A. Robertson, Associate Construction Engineer on the Nottoway Project.

Road Oil Is Redefined

The following revised definition of road oil by the Office of Petroleum Administration for War is quoted from a recent communication received by the Public Roads Administration from that Office: "Road oil is a slow-curing asphaltic product used in the construction and maintenance of roads. It includes any product derived from petroleum which, upon distillation to 680 degrees F, will yield a residue having a penetration at 77 degrees F, 100 grams, 5 seconds, of more than 350, and it also includes all crude petroleums. Asphaltic materials having the above characteristics are not classed as road oils when they are used exclusively for fluxing natural rock asphalt or native asphalt or when used with powdered-asphalt paving mixtures."

This definition of road oil supersedes any previous definition. The revision was necessitated by the change in the specification limits for the residue from distillation of MC-1 announced in Petroleum Directive No. 66, amended as of May 22, 1943.

High Speed Motors On Low Speed Ranges

A new circular on the use of Allis-Chalmers high-speed squirrel-cage motors and how they can be used in low-speed ranges to save money and material has recently been issued by the Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Lo-Maintenance motors and Texrope drives working together as a team make possible unusual economies and efficiency in drive.

Full information on this combination may be secured direct from Allis-Chalmers by mentioning this item.

GEERPRES

Mop Wringer

In Service for Total Victory

Actual Savings in Mop Heads, Floors, Furniture, Time and Effort

GEERPRES WRINGER INC.

Muskegon, Mich.

CHEVROLET TRUCKS

Serve Our Armed Forces in Many Parts of the World

That's the story of these big, rugged, Chevrolet-built military trucks —*and of many, many other kinds of Chevrolet-built war equipment* —as Chevrolet plants continue to work day and night turning out

VOLUME FOR VICTORY

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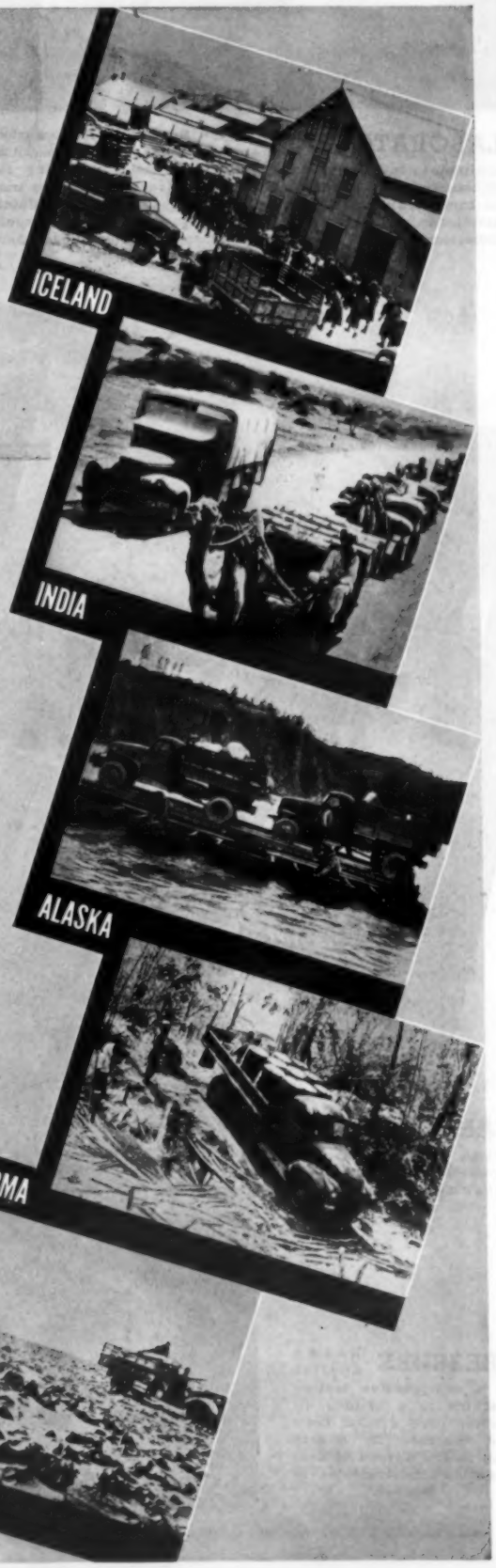
GENERAL MOTORS

★ BUY ★
★ U.S. WAR BONDS ★
★ AND STAMPS ★



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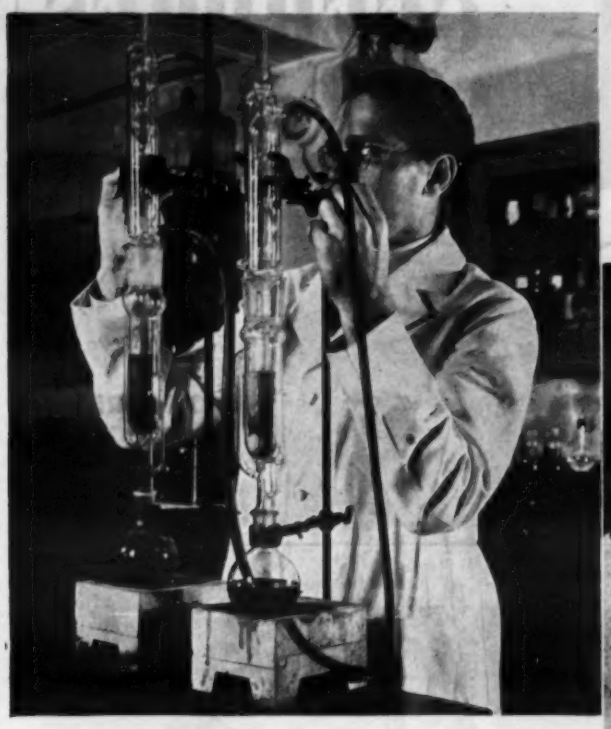
For Giant C

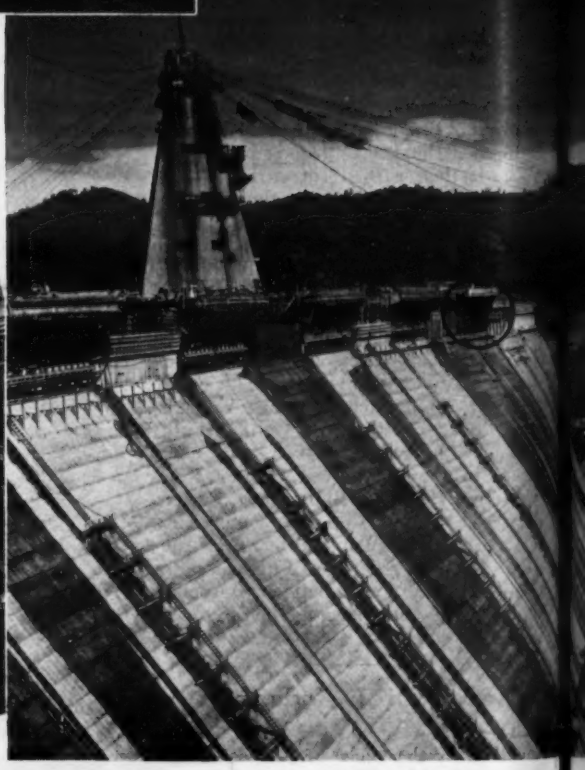
(Bureau of Re



LABORATORY tests in the Bureau of Reclamation's laboratories in Denver, Colo., maintain complete control over the quality of materials going into Shasta Dam in California. Above, chemical analyses are made of innumerable substances, from rock and steel to plastics and paint. At right, a photoelastic interferometer measures deflections as little as one-millionth of an inch, to insure absolute precision.

NEARING COMPLETION. roadway level. The forms in place fo abutment of the dam show several bl Pacific Constructors, Inc., a group o who are building

SCALE CHECK on the sand batcher in the concreting plant.



SAMPLE. A vibrating screen grades a sample batch of concrete sand into six sizes for quantitative analysis.

PRESSURE being applied by a compressive testing machine to a 22-inch diameter core drilled from the concrete in Shasta Dam in the Bureau of Reclamation's laboratories in Denver.

THE BREAK. With a loud crack, the test specimen of concrete fails under a load of over 2,000,000 pounds, showing ample strength to withstand the water pressure at the bottom of a reservoir several times as deep as the one to be formed behind Shasta.

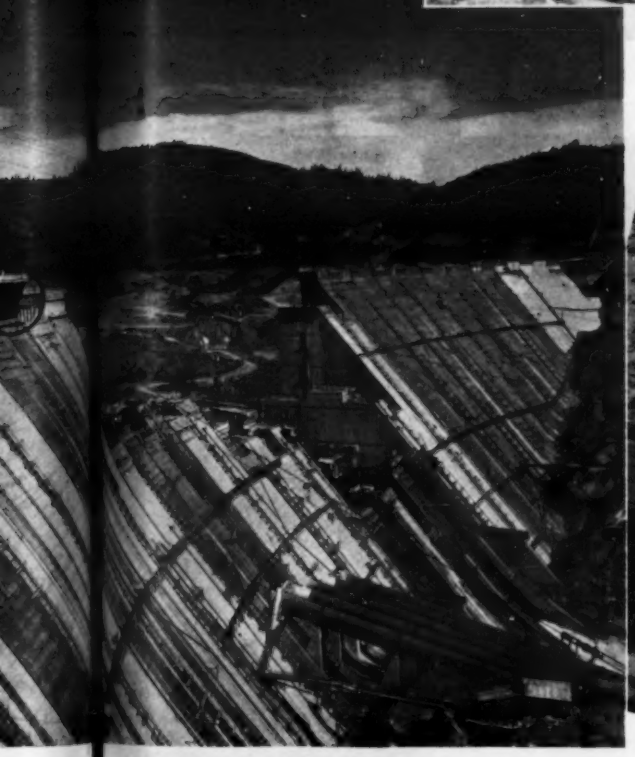
ne at Shasta Dam

y and Field Testing of Reclamation Provide Contr of Materials ant Concrete Dam

(Bureau of Reclamation Photos)

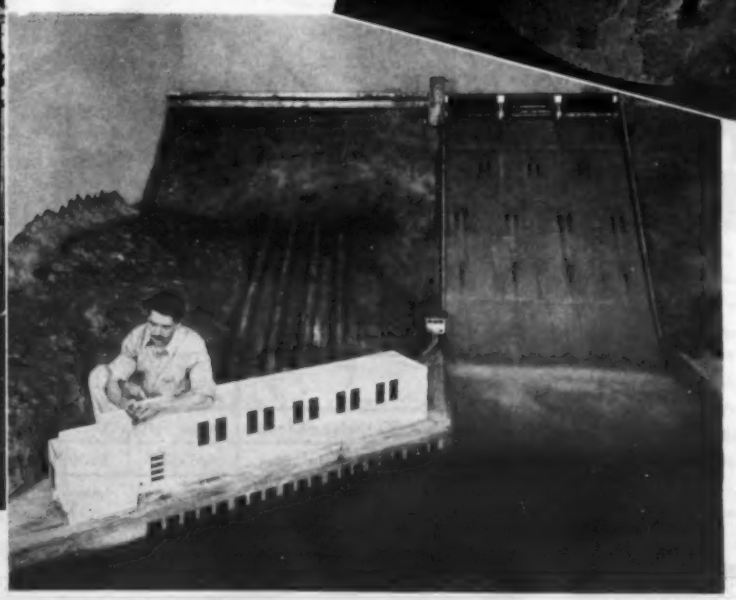
LETION ... 8 of Shasta Dam, shown in the ... below, was the first to reach ... in place for ... cantilevered section on the right ... several ... ady for the final concrete pour by ... a group of ... nationally known contractors, ... building ... sive structure.

SLUMP TEST. Rigid control is maintained over the concrete being placed in Shasta Dam by both laboratory and field tests. Above, rodding concrete in the slump cone on the testing platform of the contractors' concrete mixing plant at the dam. At left, the operator is measuring the slump of a production-run batch. Over 5,400,000 cubic yards of concrete has already been placed in this structure, with less than 1,000,000 to go.



CORE of concrete extracted from Shasta Dam for laboratory load tests.

LUCITE model of one of the Shasta river-control conduits makes possible laboratory observation of the operating characteristics of the tube valves to be installed in Shasta Dam. Pressures in every part are checked by piezometer readings.



GAGES in place to determine Poisson's ratio and the modulus of elasticity of a concrete core in the Denver laboratory.

MODEL. A hydraulic model of the central section of Shasta Dam, on a scale of 1 to 68, affords a preview of flow conditions with a simulated discharge of flood proportions going over the spillway.

Pipe-Line and Utility Post-War Construction

(*Continued from page 2*)

epic. The effect of this utility on the future economy of the oil transportation industry is another story. The pipe line and pumping stations built at a cost of $95,000,000 as a needed wartime project will continue in operation in peacetime to influence future programs for moving crude and petroleum products between the East Texas fields and the North Atlantic seaboard served by 20-inch lines connecting with the northern terminus of the "Big Inch" line.

The cost of moving oil by pipe line between these termini is reported as about 1/13 the cost of tank-car shipment and 1 cent per barrel lower than by the most modern tankers. These figures might lead one to believe that pipe lines will be built as the major method of transporting petroleum products in the post-war era, with visions of hundreds of thousands of miles of this type of construction in prospect.

Such is not the case, as the costs given above are for operating the line and do not include the construction cost which has been financed largely by the Federal government as a necessary war measure to provide the least expensive method of land transportation to overcome the loss of tankers through sinkings and their use in overseas service.

Contractors may look forward, however, to an expansion of the network of natural-gas pipe lines over wider and wider areas. Their cost is less per mile, the relative income from the product transported much higher, and hence their cost can be amortized well within their service life. Already, 85,000,000 people in the United States enjoy the convenience and comfort of metered natural gas from newly developed fields for cooking and heating, leaving a huge potential market still to be tapped.

Gas and Electric Utilities

Major companies in the gas and electric utility fields are not post-war-construction minded, at least as far as any information they are willing to release at the present time. They think first of means for absorbing the immense war load that will evaporate rapidly after our axes cut down the Axis. The principal method to be used for establishing a market for this excess power will be a stimulated appliance sales campaign, including gas and electric refrigerators, gas ironing equipment and electric irons, in fact the great multitude of large and small consumer appliances for home, office, and shop.

The primary outlet for gas will be in gas heating and in air conditioning. This has a very close tie-up with the prospective $50,000,000,000 housing program that is well-defined as a post-war need. The 1940 U.S. Census reports 3,800,000 homes heated with gas fuel, so that what was a primary outlet for natural gas in pre-war days may well become a major outlet in post-war days for manufactured gas as well.

In the electric utility field, the opinion has been expressed that power will be produced by the same generators and sent out over the same lines which are now in use, so that the great need is to sell the appliances which the consumer will want to absorb the excess load developed for war purposes. However, there is a field of application of electric current that has not been fully appreciated in post-war planning, namely, the economical use of electricity for water and space heating as developed by the war. This means a tremendous new load, in competition with coal, oil and gas, and if its advantages are fully explored will undoubtedly necessitate expansion of existing generating plants.

The most economical expansion in electric power production outside the hydro field would be the use of higher steam pressures, installing new turbo-generators to use the high-pressure steam, and then operate the existing plant from the exhaust of the new high-pressure units. This means new plants, expansion of steam-producing facilities —construction!

H. C. Thurk, President, Bradford Electric Co., Bradford, Pa., and Chairman, Post-War Planning Committee of the Edison Electric Institute, in addressing the Eleventh Annual Meeting of the Institute on June 3, 1943, said, "Our engineers have the job of determining now what additions and replacements must be made to generating, transmis-

(*Continued on next page*)

Bureau of Reclamation Photo

The waters of the Columbia River, now wasted over Grand Coulee Dam spillway, will be used for both power and irrigation when pumping and other facilities have been completed in the post-war period.

Speeding production of the Nation's wartime fuel supply

PMCO **WELDED DIPPERS**

give greater daily output to this MANITOWOC SHOVEL in Ohio coal fields

● The 2-yard PMCO Welded Dipper on this Manitowoc Model 3500 stripping shovel, actually weighs 600 lbs. less than a 1¾ yard solid cast type dipper. It gives 14⅓% added payload capacity to the shovel and the 600 lbs. saving in burdensome dipper weight makes possible speedier operation of the 45 ft. boom and 34 ft. dipper stick.

● PMCO Welded Dippers have built in, reinforced strength for continuous digging in hard material. Note the teeth marks in this hard bank of overburden.

● 2 yard PMCO Welded Dipper

	Empty Dipper Weight	Loaded Dipper Weight	Net Pay Load	Increase of Payload	Increase Percentage
2 yd. PMCO Welded Dipper	4100 lbs.	9500 lbs.	5400 lbs.	675 lbs.	14⅓%
1¾ yd. Solid Cast Dipper	4700 lbs.	9475 lbs.	4725 lbs.		

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Electric Power Needs In War-Free America

(*Continued from preceding page*)

sion and distribution facilities to supply the increased loads to come eventually from postponed civilian demands, the return of standard time, the elimination of brownouts and blackouts, and the probable tendency for industry to curtail night work and concentrate production in the eight-hour day shift. The work week will undoubtedly be shortened in many areas, thereby further contributing to lower system load factors.

"Detailed construction plans which can be put into prompt use at the close of the war will contribute materially to combatting the unemployment problem. If operating companies would proceed with the preparation of such plans, it would be possible at a future date to announce a construction program for the industry. The publication of such a program would indicate to the public, more effectively than perhaps anything else, that we have been doing some fundamental thinking on the problem of providing an adequate electric-power supply after the war, and that through that program would furnish additional employment in communities throughout the nation."

"Markets After the War," a study by S. Morris Livingston, released by the Bureau of Foreign and Domestic Commerce, points out, "Because many consuming plants (such as wartime aluminum plants) are being operated 24 hours a day, the ratio of electric-power output to installed capacity is greater than will be maintained in peacetime." The peacetime demand will be spread and increased by the far greater "use of electricity in post-war America, carrying unprecedented comforts into the average home, according to C. A. Powel, Manager of the Headquarters Engineering Department of the Westinghouse Electric & Manufacturing Co. "Just before Pearl Harbor, the average residential consumption of electricity was 1,020 kilowatt-hours a year. As some of the new sources of increased power demands in the post-war era, we have wider use of fluorescent lighting for both utility and decorative effect in the home, the electrostatic air cleaner, all-electric coordinated kitchens, deep freeze units, and popular use of television. The increased demand for power will require that electric utilities expand their distribution systems to keep electricity flowing into homes at top efficiency. This might be accomplished in densely populated areas by extended use of secondary networks, underground latticeworks of electric conductors which insure reliability of service and economize on equipment. In less concentrated residential areas, transformers could be connected in parallel to permit heavier electrical loads for homes."

A spokesman for the electric utilities industry pointed out to us that there is an increasing volume of deferred maintenance within the industry which will necessarily be a primary source of post-war activity. Normally the electric-power industry spends in the neighborhood of $100,000,000 a year on its distribution lines alone because of the shifting of customers. This will continue with possible accentuation in the first post-war decade.

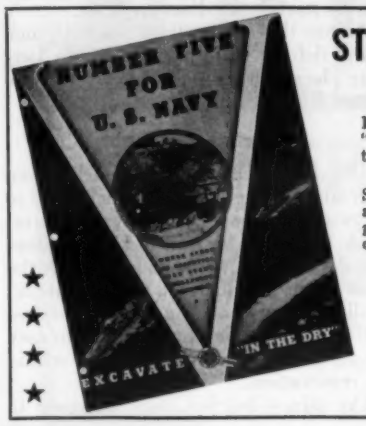
It is believed that in the first post-war year several hundred million dollars will be spent on new construction, plant expansion, extension of service, etc., and a like amount for maintenance. An equal amount will be spent in each category in the second post-war year, but increasing amounts are bound to be needed in years three and four when industries consuming electric current will have completed their conversion and have entered the period of expansion.

Hydro-Power Development

The major areas in North America where hydro-electric developments are possible and even likely in the post-war period are the Pacific Northwest, the St. Lawrence Waterway, and the Tennessee Valley. The construction involved will cover both dams and power stations as well as new, and extension of old, transmission lines.

The Federal Power Commission has reported projects aggregating $600,000,000 consisting of hydro-electric power facilities and transmission lines proposed for post-war construction. These include some projects definitely proposed, others under survey but not yet definitely proposed, and none of them have been authorized. The Federal Power Commission does not construct projects itself, but recommends them for construction by other Federal agencies. It also licenses projects of private, state,

(*Continued on page 46*)



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In war and in peace, contractors and engineers "in the know" use STANG Wellpoint Equipment to keep construction jobs "in the dry."

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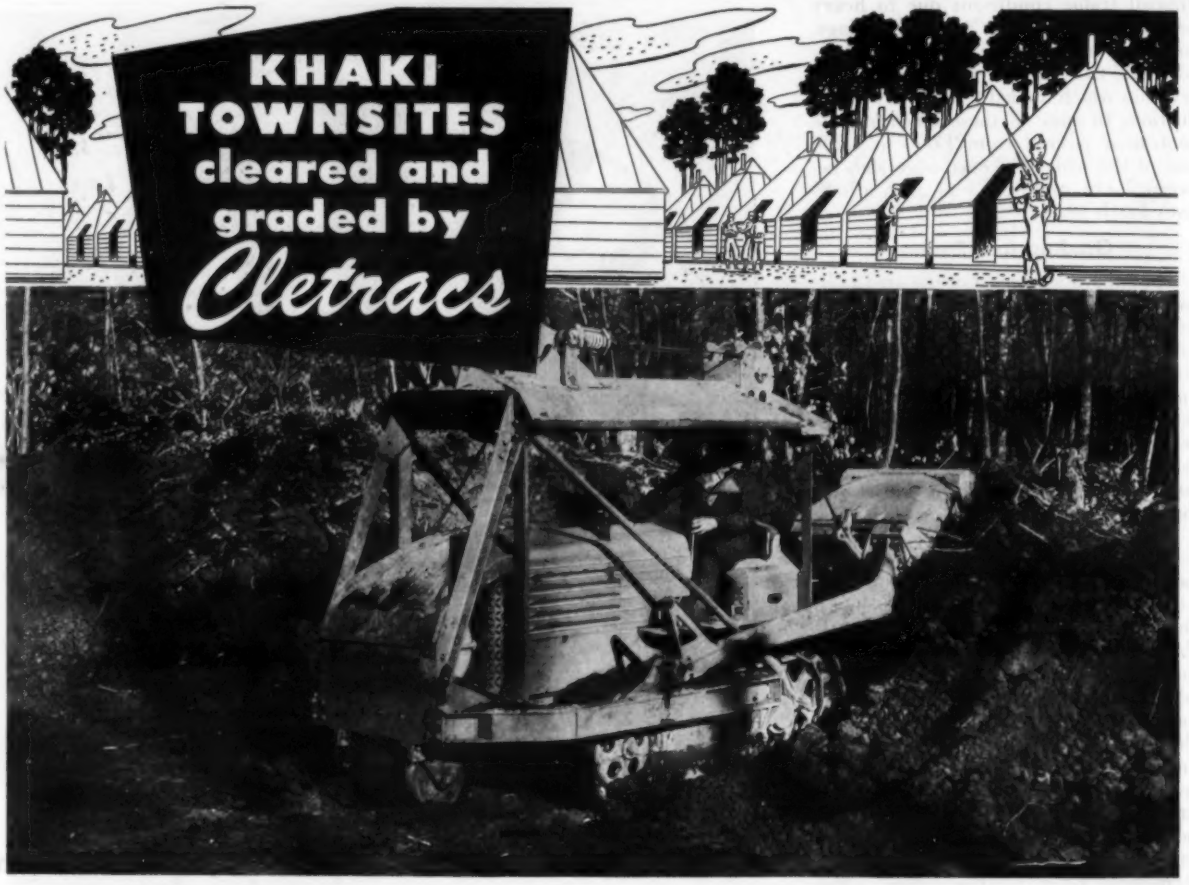

• Khaki towns—temporary homes for the boys of our armed forces during their training periods—have been built from coast to coast. In many instances these towns seem to have been built overnight.

The important preliminaries of clearing and grading the sites for many of these encampments have been done by Cletracs with supplementary equipment, such as the Sargent loader illustrated above. Bulldozing, hauling, tree-felling, earth moving, road building—whatever the job, no matter how tough—you'll find Cletracs more than adequate.

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Heavy-Traffic Paving At Large Army Depot

Thickened-Edge Concrete Slabs 22 Feet Wide Laid Rapidly in Close Quarters; Second Paver Adds Speed

✦ WITH warehouses going up "like asparagus in May" and materiel awaiting hauling either to storage or for shipment to war centers, the question of heavy-duty pavement is of utmost importance at an Army Depot. At the particular Depot in question, expansion has been unbelievably fast and stores were piled up awaiting facilities. A contract for 6.1 miles of 22-foot concrete pavement with a 9-7-7-9-inch section was awarded and the contractor told to "make speed".

Work proceeded rapidly with the advantage of a short haul for dry batches from a nearby commercial plant but with difficult traffic conditions due to heavy personnel traffic, heavy materiel haulage, construction hauling, rail traffic and inadequate existing streets within the reservation which tended to slow down production. In spite of these obstacles, the contractor poured from 1,000 to 1,200 feet of the wide thickened-edge slab between 7 a.m. and 5:30 p.m. with a half-hour lunch period.

Grading and Forms

The subgrade in most of the area to be paved was a gravel fill with many large stones that caused considerable delay in completing the grade with both the power grader and the subgrader on the fine grade. In fact, the blades on the subgrader used to remove the dirt from between the forms were frequently bent by the impact of the stones and had to be removed, heated and bent back into shape.

The form trench was dug by hand, one man set the line for the forms, and then the 9-inch Heltzel steel forms were set by two form setters and two helpers. The forms were immediately consolidated by a Lakewood mechanical tamper. One of the form setters and his helper went back behind the subgrader and did the final line-up of the forms. The final subgrade was cut by a Blaw-Knox subgrader with an operator and two men who shoveled out the excess dirt left against the forms and cleaned the 2-foot thickened-edge trench. The final grade was rolled by a Buffalo-Springfield 8-ton tandem roller. The forms were oiled ahead of the pouring by one man with a Hudson hand spray.

Joints and Steel

The specifications called for expansion joints spaced 140 feet apart and contraction, or dummy, joints every 20 feet between. Three men were employed to set the expansion joints and the steel. The expansion joints were composed of two 11-foot lengths of Carey Elastite 1 inch thick set ¾ inch from the top of the slab with an equal-leg cap over the top. The load-transfer device consisted of fourteen ¾-inch round dowels 18 inches long, greased and capped on one end. The entire joint was held firmly in a vertical position by four pairs of pins driven onto the hard subgrade. There was no steel at the dummy joints.

Across the longitudinal joint ½-inch round deformed tie bars 30 inches long were placed on 32-inch centers and supported by wire chairs.

Pouring the Slab

The dry batches from a nearby commercial batching plant were delivered to the two MultiFoote 27-E pavers in three-batch trucks to be mixed 1¼ minutes. The dry batches were made up with the stone on the bottom, then the cement and finally the sand on top to prevent loss of the cement in hauling and also to save handling the cement separately within the reservation.

The mixed batches were delivered to the subgrade and immediately evened off between the forms by a Jaeger spiral spreader so that but one puddler was required. Water for the mixing was provided by a pair of trucks with 1,000-gallon tanks which were filled at hydrants within the Depot. The power plant of a Jackson vibrator was mounted on the finisher and the vibrating unit used to insure a dense concrete along both forms and on both sides of all joints.

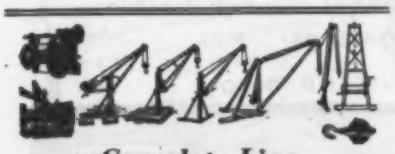
Finishing and Curing

Two men carried back the extra concrete needed to maintain a 4-inch roll in front of the first screed of a Jaeger-Lakewood finishing machine powered by a Waukesha engine. Immediately behind the finisher the slab was checked with a Cleveland 10-foot aluminum straightedge. This was followed by a Cleft-Plane machine which set the center-joint material from a roll of ⅛ x 2-inch impregnated material. The operator and his helper cut the transverse dummy joints with the saw-tooth cutter at the back of the machine and then set the two 11-foot lengths of the ribbon in the slot and hand-floated over it.

Where low spots were shown up by the 10-foot straight-edge, they were filled and worked smooth by the two hand finishers using long-handled 4-foot x 6-inch floats. When the slab was satisfactory it was dragged with burlap, given a roughening non-skid finish with a Heltzel fiber broom, and edged. The caps of the expansion and dummy joints were lifted and edged immediately ahead of the fiber-broom finish. The curing was started as soon as the water had left the surface of the concrete. A membrane curing of Aquastatic was applied by means of a Hudson power spray.

The forms were pulled the following day by the curing crew before they were called upon to start the spraying. They also poured the expansion and dummy joints, using asphalt heated in a Littleford kettle and hand pouring pots.

This extensive contract for heavy hauling roads within an Army Depot was constructed under the direction of the U. S. Army Engineer Corps.



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In producing a quality motor oil, it is necessary to take out the sludge and varnish-forming elements. In Stanolube H.D., after we have made a premium motor oil by a modern solvent-extraction process, we further *enrich* it by adding to this highly refined oil a special oxidation inhibitor and detergent developed in Standard Oil laboratories. Thus Stanolube H. D. is a premium motor oil, *plus* the extra heat resistance so valuable in heavy-duty operation. That's why this motor oil is so well adapted to protect equipment against the high temperatures resulting from the close clearances and high compression of today's gasoline and Diesel engines.

Oil is ammunition . . . Use it wisely

Although civilian use of this oil is now restricted, the need for conserving fleet equipment was recognized. Standard Oil was given the "green light" to put this maintenance-saving oil on any heavy-duty Diesel and gasoline-powered fleet equipment.

Make a side-by-side test of Stanolube H. D. with several of your hardest working trucks, against the remainder of your fleet. It represents our most advanced development in an oxidation-inhibited, detergent-type oil for protection against varnish, engine deposits, and the resultant premature overhaul and maintenance expense.

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A Standard Oil representative can advise you which of these war-duty oils is best fitted for your equipment.

From his experience with these products on other fleets, he can help you save both scarce parts and labor. Call any local Standard Oil (Indiana) office, or write 910 S. Michigan Ave., Chicago, Ill. In Nebraska, call any Standard Oil Company of Nebraska office.

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★ FLEET CONSERVATION SERVICE

Making post holes under difficult conditions with a Speedigger.

New Post-Hole Digger Used on Farm Tractor

The Speedigger, a new wheel-tractor-mounted auger for the speedy digging of post holes for guard rail or right-of-way fences is also adaptable to preparing the holes for planting trees and shrubs on roadside-development projects, for removing temporary or rotted posts quickly and easily, for digging sign-post holes, slanting holes for temporary fence, sounding holes for highway bridges, and many other similar digging jobs.

The auger, which digs any depth hole up to 40 inches and at any angle up to horizontal position, can be mounted on any standard wheel or farm-type tractor, at either the front or the rear of the machine, and is operated by the regular tractor belt pulley. It can be attached in 9 minutes and detached in 2 minutes, the manufacturer states. The standard Speedigger is equipped with a 9-inch auger, but 5, 6, 7, 10 and 12-inch sizes are available. It will drill on any grade on which the tractor will operate, and it is stated that a hole 38 inches deep can be dug in 20 seconds. The operator stands on a platform, behind a protective rail, out of the dirt and away from all moving parts. One bolt changes augers, and one adjustment spaces the holes evenly, as little as 3 feet apart. One movement lifts the auger and frees the dirt.

Further information on the Speedigger may be secured by interested state and county highway engineers and by highway contractors handling roadside items direct from the Equipment Sales Co., 16 No. Carroll St., Madison, Wis. Just mention this magazine.

Flood Damage to Roads Costs Indiana $250,000

Final estimates of damage to the Indiana state highway system during the May floods amount to slightly more than $200,000, while extra labor and materials costs will boost this total to $250,000.

Damage to bridges and other structures on the state highway system from flood waters will necessitate repairs costing approximately $100,000, while the cost of repairing the damage to road surfaces and shoulders will run slightly higher, according to estimates by the district engineers. The heaviest damage to roads was in the Crawfordsville and Vincennes districts which bore the brunt of the flood conditions in the White and Wabash Rivers.

In addition to the repairs and replacement of roads and structures, highway costs were increased during the emergency by the additional time worked by the field staffs, the materials required to meet flood conditions, and the extra use of trucks and other equipment. These costs bring the total to about a quarter of a million dollars.

White Print, Maroon Line

A new folder illustrating how an Ozalid print with maroon lines on a white background stands up in comparison with a blueprint under actual service conditions has been issued by Ozalid Products Division, General Aniline & Film Corp., Johnson City, N.Y. The maroon shows even when the print is covered with grease or dirt stains so that it is easily possible to follow the smallest details.

This folder also contains samples of Ozalid's complete line of new sensitized materials which are 50 per cent rag content and develop blue, black, maroon and sepia lines. In addition, the Ozalid dry developing process is described completely, and the whiteprint machines are illustrated.

Copies of this folder may be secured direct from the manufacturer by mentioning this item.

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POWER MOWERS
All Over the World
TORO MANUFACTURING CORP'N.
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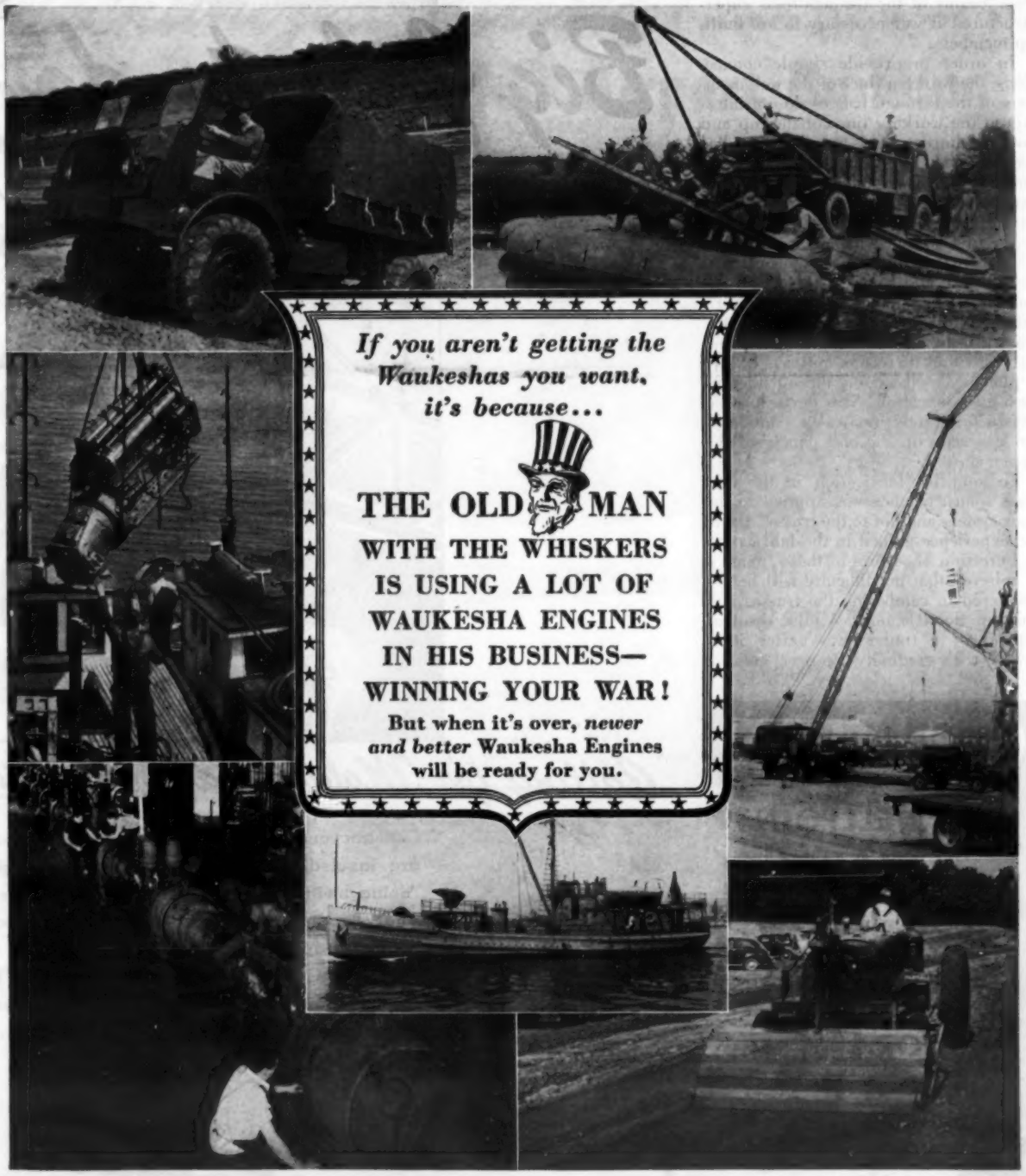
If you aren't getting the Waukeshas you want, it's because...
THE OLD MAN WITH THE WHISKERS IS USING A LOT OF WAUKESHA ENGINES IN HIS BUSINESS— WINNING YOUR WAR!
But when it's over, newer and better Waukesha Engines will be ready for you.

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS., New York, Tulsa, Los Angeles

MORE POWER FOR VICTORY

WAUKESHA ENGINES

Timber Bridges Built Economically at Yard

(*Continued from page* 15)

connector rings were placed and, prior to dismantling for storage or shipment, all members were match-marked. The use of a properly equipped central fabricating plant promoted efficiency and economy. It is obvious that transportation of tools and equipment to each bridge site, together with the setting up of the necessary plant, entails considerable time and expense. Furthermore, electrical power-driven tools are used in the fabrication and frequently such power is not available at the bridge site.

All the designs were based on the use of a good grade of native hemlock timber, except for the stringers of the shorter spans. These were secured by resawing heavy southern-pine timbers salvaged from a mill building which was dismantled during the autumn of 1941. As no timber of the necessary strength and dimensions was available for the floor beams of the through-truss superstructures, it was necessary to use built-up members.

In order to provide simple connections, the working lines of the web members of the through trusses do not intersect at the working lines of the top and bottom chords. This arrangement has the disadvantage of increasing the secondary stresses in the chords, and the end panels of the upper chord showed considerable deflection under this action in the first 65-foot truss when erected at the yard. Structural steel plates of sufficient length and width to engage all the bolts in the hip connections were fabricated from salvaged stock. After the trusses were blocked up at each panel point, so that there was no truss action, a plate was placed on the outsides of each hip connection. This device proved satisfactory and practically eliminated the deflection in the end panels of the upper chords.

To simplify fabrication in the first truss spans, camber was applied to the floor system and not to the trusses. From the experience gained in the fabrication and erection of several of these spans, it is believed that no difficulty will be encountered in cambering the trusses and built-up floor beams. As the residual camber of a timber truss after it is swung will gradually decrease over a period of time, a camber of approximately 1/120 of the span seems desirable. This camber will be reduced by about one-third when the span is swung. It is anticipated the remaining camber will be further reduced, due to the shrinkage of the timber and the gradual take-up of the connections.

Detail of a typical built-up floor beam.

As native hemlock retains little creosote when plant-treated, all the timber was given two heavy brush applications prior to storage or shipment. This treatment, together with a tar coating applied to the ends of all members, aided materially in reducing checking of the timber. The hemlock timber was received directly from the mills and was very green. In spite of this unsatisfactory condition, only a few members had to be replaced because of excessive checking.

Erection

Thus far timber superstructures have replaced bridges of light steel construction. By using the existing decks, the timber trusses have been erected without the use of falsework. The usual practice has been to assemble the trusses in two sections and place them outside the existing trusses by means of a small truck crane. One section is placed and supported by the existing deck until the other is placed and the two connected. The truss is then braced so that it is not disturbed when the old deck is removed. After the removal of the old deck, the

(*Concluded on next page*)

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"GRIFFIN POINTED WELLPOINT FACTS" chock full of latest information on Wellpoint Systems for dewatering, emergency and permanent water supply systems, also information on pressure pumps and data for jetting.

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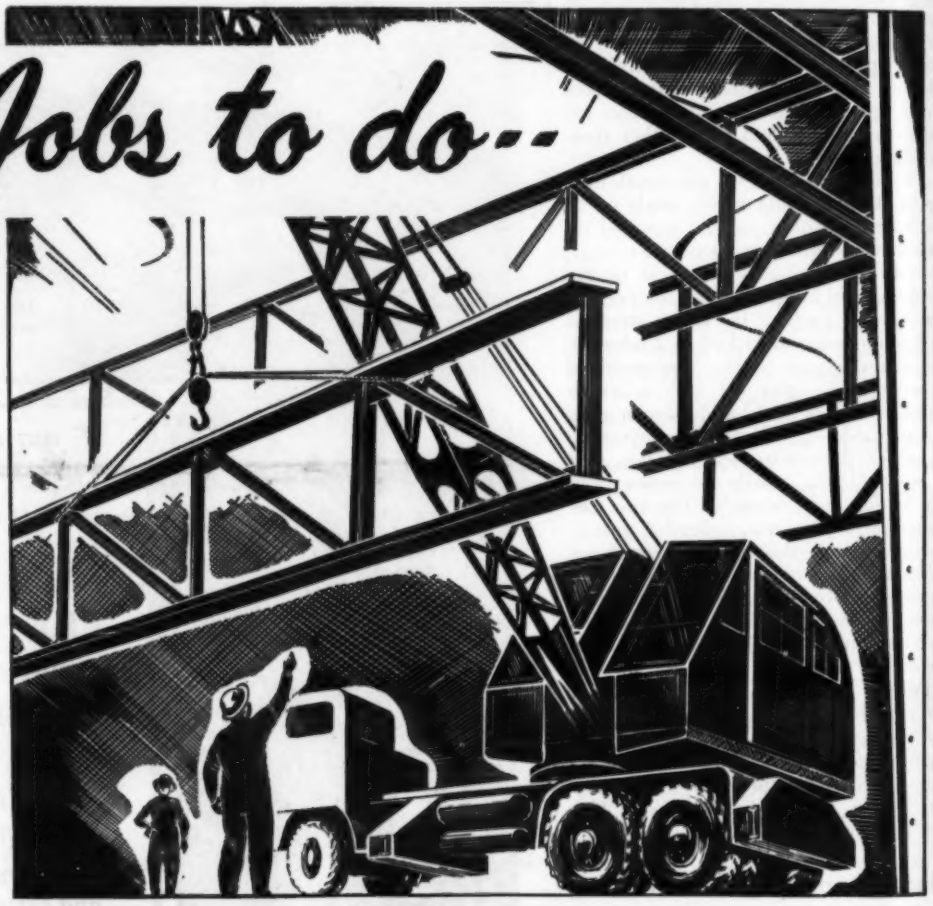
Big Jobs to do...



Calling for Mobility and Stamina . .

Construction—earth moving—trenching—loading: these and countless other tasks are labeled, "NOW"! United Nations' engineers are winning lasting fame for "doing-the-impossible"—and along with other equipment the mighty MICHIGAN Dual Tandem-drive Crane is playing its part. Today, military battles are won by highly MOBILE units with STAMINA to give them staying power — the same two factors that have long been featured in MICHIGAN Shovels and Cranes. Fighters now, these MICHIGANS will be equally important in the vast peacetime construction program after V-day.

Write for Bulletin CE-73 and specifications.

AIR CONTROLLED

MICHIGAN

POWER SHOVEL CO.

BENTON HARBOR, MICHIGAN

Short-Span Bridges Are Built of Timber

(Continued from preceding page)

trusses are moved if necessary to their proper positions and the remainder of the superstructure is erected.

It is proposed to give these structures a brush coat of creosote and to tighten all bolts once each season. It should be realized that their useful life is uncertain and cannot be compared with that of the old covered timber bridges in the State, which, in many cases, have given satisfactory service for 50 to 100 years.

Costs

The relatively low costs of these bridge superstructures have been gratifying. The 65-foot superstructures were fabricated for approximately $35 per linear foot of span. This amount covers all timber, hardware, equipment rental, and labor. One of these superstructures was hauled approximately 150 miles by truck and erected at a cost of less than $10 per linear foot of span. The cost of material and fabrication of a 20-foot stringer span was $25 per linear foot of span. A 75-mile haul plus erection cost about $5 per linear foot of span. These costs are about 40 per cent of those of similar spans constructed of more permanent materials.

Previous Timber Construction

Prior to 1941 the Department had constructed under contract one covered through-truss timber span and two temporary suspension foot bridges employing timber stiffening trusses. Teco timber connector rings were used for the connections on all of these bridges. The covered timber span was constructed of western fir and has a span of 84 feet. It was designed for an H-15 live load and should give many years of satisfactory service. Its cost per linear foot of span was in excess of $120.

The stiffening trusses, floors and cable towers for the foot bridges were of western fir, the main spans were 425 feet and approximately 200 feet. As their construction was due to the loss of other bridges by flood, their fabrication and erection were carried on as rapidly as possible. Much of both operations, therefore, occurred simultaneously so that detailed costs are not available.

Look Out, Men Working

Each spring and early summer several thousand highway maintenance employees are working on the roadway, repairing the damage done by winter weather and traffic. Our highways not only represent a huge investment of public funds but at present are vital in the transportation effort necessary for victory. These men are working to provide comfort and safety for your motoring; to protect your interest in our highway investment; to insure continued uninterrupted flow of vital materials.

Their work is hazardous! In many instances it must be done in the face of moving traffic. Each year some of these workmen are injured or killed. Highway officials are doing everything possible to protect these men, and reckless or fast driving by any motorist in the vicinity of a repair job is inexcusable. Cut your speed, bring your vehicle under absolute control when you see men working, and await their signal for you to proceed. You are not only protecting the lives of these men but may prevent a serious accident to yourself. Your consideration will also allow the crew to operate more efficiently—all saving in highway costs is returned to you in better highways.

The two paragraphs above are from the May-June 1943 issue of the *Safety Bulletin*, published by the Illinois Division of Highways, Springfield, Ill., and distributed to Illinois citizens.

WON'T QUIT
or cause time out

A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

The Hayward Company
32-36 Dey Street
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Hayward Buckets

OUTWARD BOUND

JAHN Trailers are moving right along with the Army putting battle material where it's wanted in a hurry.

War time performance can teach much for peace time operation. The advantages that Jahn Trailers bring for getting the war jobs done will help you meet competition after the duration.

Sturdy, heavy frames, proved brake and axle design, easy convertibility from full to semi Trailer, any axle or wheel combination, and other Jahn features assure you certain dependability and adaptability to your equipment moving problem. Plan for the future. Let us send you the new Jahn catalog to help you.

TO PUT WAR MATERIALS WHERE THEY'RE WANTED!

C. R. JAHN COMPANY
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Any Axle or Wheel Combination

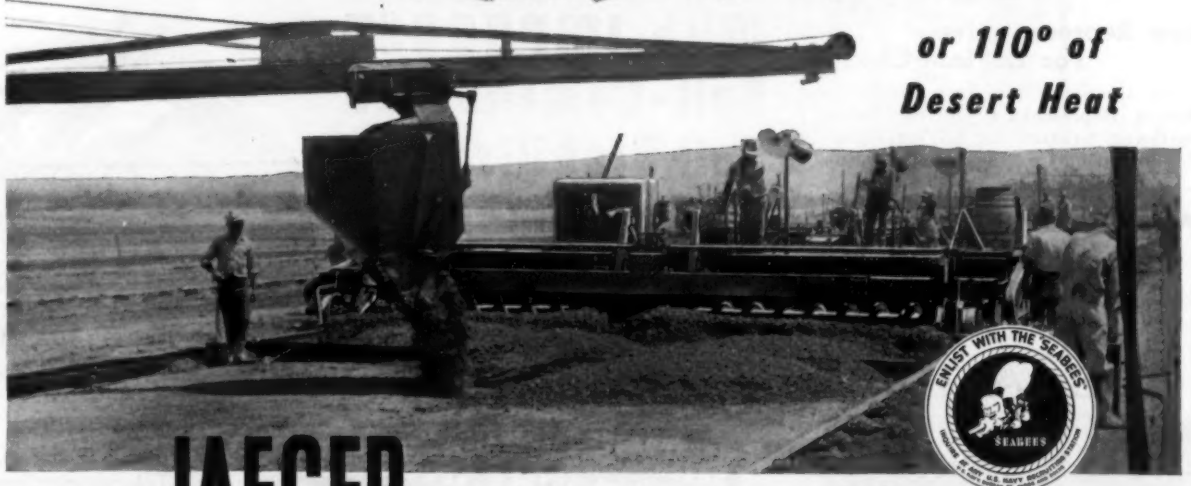
"COME TO TRAILER HEADQUARTERS"

JAHN Heavy Duty TRAILERS
in Capacities from 5 to 100 Tons

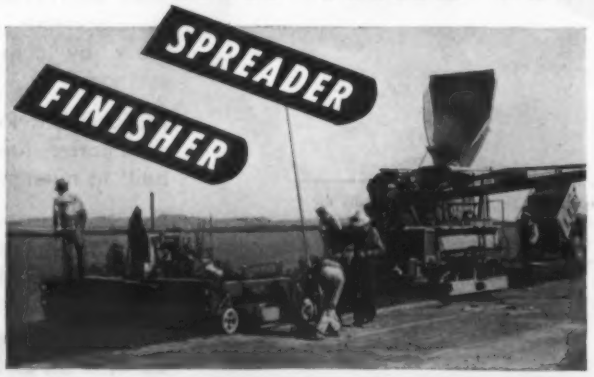
Mechanized Paving { Originated by JAEGER-LAKEWOOD }
Speeds YEAR'ROUND Airport Building

Whether It's 7° Above Zero
(9° Below at Night),

or 110° of
Desert Heat



THIS JAEGER TEAM
CAN TAKE IT!



The Finishing Machine (originated by Jaeger-Lakewood in 1917) and the Concrete Spreader (originated by Jaeger in 1931), teamed with the modern paver, have made possible today's year 'round paving of vitally-needed airports, made possible today's high production*, made practicable the handling of today's dry mixes without segregation and with a minimum of manpower. By finishing millions of sq. yds. of slab in subfreezing temperatures and, on some jobs, maintaining constant 24-hours-a-day operation over many months, these machines have further demonstrated why contractors depend on Jaeger-engineered equipment to meet their severest schedules and deliver a satisfactory and profitable finished job.

*Over 275 linear ft. per hour in 25 ft. width, over 475 linear ft. in 10 ft. width of denser, stronger, smoother slab.

THE JAEGER MACHINE CO.
701 Dublin Ave. Columbus, Ohio
Mixers, Pumps, Hoists, Paving Equipment

Route Modernized, Widened in Alabama

(*Continued from page 10*)

hot-mix plant was so located that trucks could deliver the stone to the drier by gravity and also remove the mixed material dumped by gravity.

All of the heat needed at the plant was supplied by fuel oil. Because it was impossible to buy a metal tank for the storage of the asphalt, an underground tank of 30,000 gallons capacity was built of concrete supplemented by a booster tank of 3,500 gallons capacity. The asphalt in the main tank was kept at a temperature of 225 degrees and then raised to 285 degrees in the booster tank, thus saving considerable fuel. The 4-inch asphalt line from the main tank to the booster tank was heated by jacketing with a 6-inch welded steam line.

The hot-mix plant has a rated capacity of 60 tons per hour but as much as 83 tons per hour has been produced. The mix for the leveling and surfacing courses consisted of 60 per cent of 2 to ⅞-inch crushed stone, 30 per cent ⅞-inch to No. 10 screen size, and 10 per cent local fine sand with 75 per cent of the sand passing a No. 40 screen. To the heated aggregates about 4 per cent by weight of 120-penetration asphalt with 10 per cent kerosene content was added and mixed for a full 60 seconds. This mix was applied to the road first in a ¾-inch leveling course followed by a finish course of ¾-inch asphaltic concrete with a higher percentage of sand and 6 per cent by weight of bitumen.

The result has been a completely new pavement with a smooth surface and a safe width for two-way traffic.

Personnel

This widening and resurfacing program of the Alabama State Highway Department has been under the direction of W. G. Pruett, Acting State Highway Director, and Marvin Taylor, Maintenance Engineer.

New Representative For LaPlant-Choate

The appointment of Jack Redfern as District Representative in the Pacific Northwest territory for LaPlant-Choate Manufacturing Co., Inc., of Cedar Rapids, Iowa, has recently been announced. Mr. Redfern, who will cover the states of Washington, Oregon, Idaho, western Montana, and British Columbia, working closely with LaPlant-Choate-Caterpillar distributors and their customers, in connection with the LaPlant-Choate line of earth-moving, land-clearing, and snow-removal equipment, will maintain his headquarters at the Spring Apartment Hotel in Seattle.

Prior to his association with LaPlant-Choate, Jack Redfern for the past eleven years covered the Pacific Northwest for D-A Lubricant Co. of Indianapolis. His earlier business connections include three years as representative of Euclid Road Machinery Co., and six years as Sales Manager of Power Mfg. Co., Marion, Ohio.

The regular purchase of War Bonds will insure Victory and the kind of post-war world we are fighting for.

The War Production Board Says . . .

"NO MORE MANHOLE COVERS of Cast Iron"

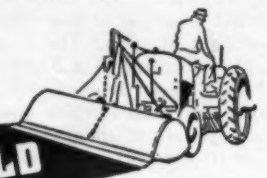
But six months before this order was issued the Cast Stone Institute and United Concrete Form Products had developed a reinforced concrete manhole frame and cover which were in commercial production throughout the country.

Only this concrete manhole cover offers these advantages:

- **Light in weight (cover weighs only 90 lbs.)**
- **Carries H-20 Highway loading (16,000 lbs. plus 25% for impact).**
- **Exposed edges "Armored" to prevent chipping due to either rough handling or wear.**
- **Saves vital steel for its important war job: meets requirements of the WPB.**

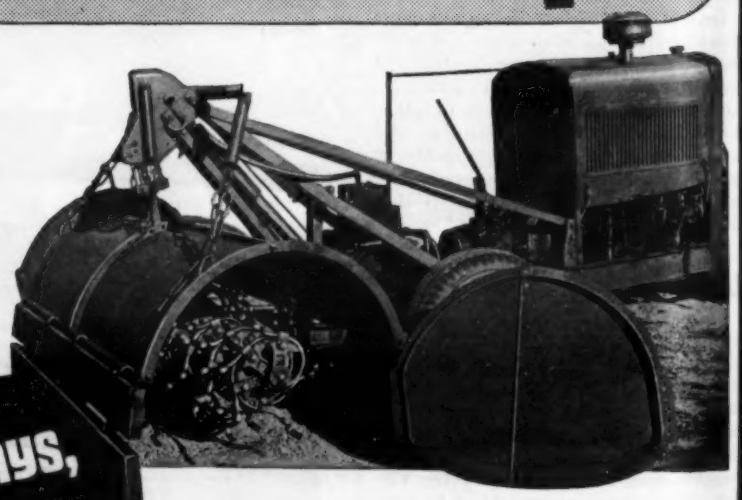
Write for the address of the distributor in your locality . . .

UNITED CONCRETE FORM PRODUCTS CO.
5243 W. 25th Place, Chicago, Ill. — 101 Park Ave., New York City



THE PIONEER STILL LEADS THE FIELD

ROTOTILLER
TRADE MARK REG. U.S. PAT. OFF.
ROADMAKER



With IMPROVED Soil-Cement and Soil Stabilization Equipment

FOR BUILDING HIGHWAYS, RUNWAYS, FLIGHT STRIPS *faster, better!*

BACK in the 30's this original "3-in-1" Rotary Action Tillage Machine was used on early experimental projects in soil-cement construction.

The landing fields and roads built then are still in use, in sound condition. They've taken the extremes of weather, the abuse of traffic. And each year since then ROTOTILLER Roadmaker has kept pace with developments in soil-cement and soil stabilization work by constant improvement in machine and method.

ROTOTILLER Roadmaker is engineered to exacting automotive standards. It is sturdy, powerful—ruggedly built to meet today's exacting war-time demands.

Contractors and engineers engaged in military construction are urged to get all the facts on this improved 1943 job-tested ROTOTILLER Roadmaker. Write for literature.

Post war plans undoubtedly will call for thousands of miles of soil-cement and soil stabilized secondary roads. Returning soldiers will find economic security in this work. Then, as now, ROTOTILLER Roadmaker will serve faithfully and well.

DEPT. N **ROTOTILLER, INC.** TROY, N. Y.

VIBER COMPANY CONCRETE

VIBRATION

MOST PROFITABLE FOR

REINFORCED CONCRETE BUILDING CONSTRUCTION

When the job calls for mass vibration —the Viber Vibrator at work above is your best bet. Especially made for walls over 10 inches thick, foundations, large girders, thick floor slabs, columns . . . large reinforced concrete bridges, grade separations, concrete floor systems, concrete arches and rigid frame structures . . . In a word, for all concrete with large aggregate and low water-cement ratio.

Write for complete VIBER data TODAY!

VIBER COMPANY
725 So. Flower
BURBANK, CALIF.

Report on Third Course On Highway Development

A mimeographed paper-bound booklet containing the papers and discussions presented at the Third Short Course on Highway Development, held at Ohio State University, Columbus, Ohio, February 25-26, 1943, has recently been issued.

With the funds and materials required to meet the needs of our highway system definitely curtailed, it was decided by those responsible for this Short Course on Highway Development that the discussions at this meeting should be devoted to those problems caused or rendered more acute by the war. The attendance at the Course was gratifying and the discussions brought out the importance of sharing experiences in solving some of the problems peculiarly associated with the emergency.

Copies of this report may be secured by interested highway engineers from Charles R. Sutton, Department of Agriculture and Landscape Architecture, Ohio State University, Columbus, Ohio, or from Dallas D. Dupre, Jr., Landscape Architect, Ohio Department of Highways, Columbus, Ohio.

Uses of Lignum-Vitae

That well-known, self-lubricating, very hard resinous tropical wood, lignum-vitae, is the subject of a bulletin "Wartime Report on Lignum-Vitae". The many diversified uses of this wood, which has a specific gravity of 1.3 and a working pressure of more than 2,000 pounds per square inch, are recorded in this report. Lignum-vitae can be supplied in the form of logs, boards, squares, rods, cylinders, blocks, etc., to specifications or in finished parts such as bearings, bushings, wheels, rollers, etc.

Copies of this bulletin may be secured from Lignum-Vitae Products Corp., 735 Boyd Ave., (4), Jersey City, N. J., by mentioning this item in your letter.

Heltzel Steel Form & Iron Co., Warren, Ohio.
Send me catalog(s) indicated.

- ☐ B-19—Steel Highway and Airport Forms.
- ☐ A-20—Steel Forms for Curbs or Curb and Gutters or Sidewalks.
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KEEP POSTED ON EQUIPMENT FOR POST-WAR CONCRETE CONSTRUCTION

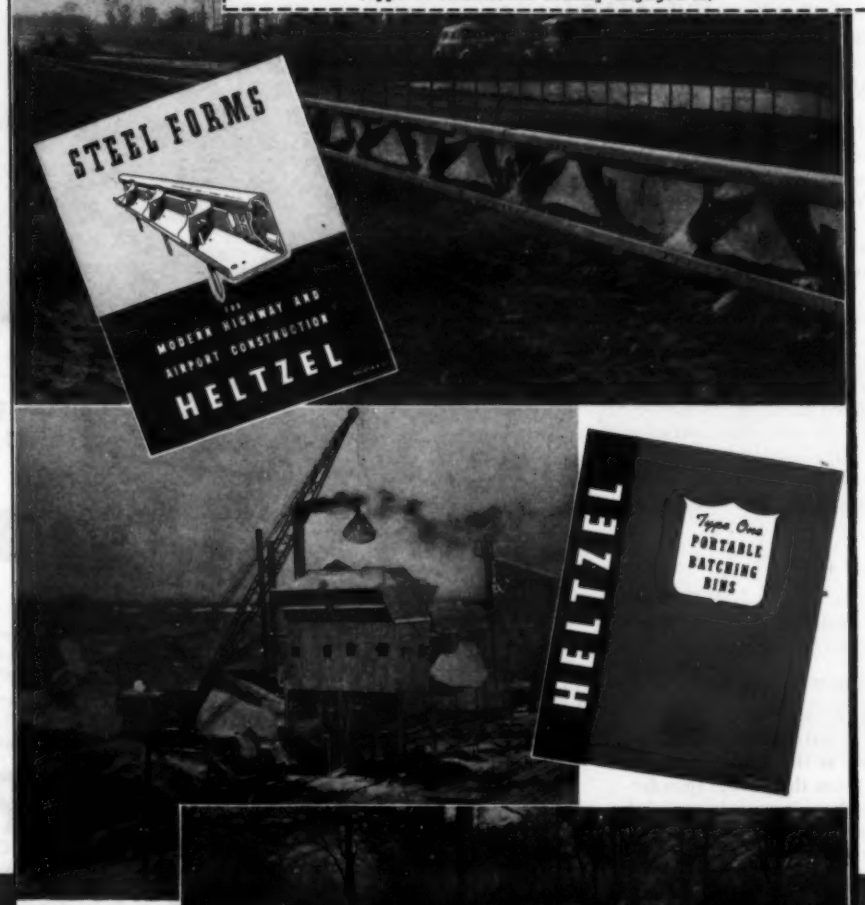
Heltzel Steel Forms and Batching Bins are being used in all parts of the world to help speed up vital concrete construction.

For the most part the equipment is the same as always . . . dependable, familiar, easy to handle units for fast, economical concrete work.

Heltzel engineers are constantly seeking to improve or adapt this equipment to ever-changing construction conditions. This information . . . these ideas are being correlated and put in catalog or bulletin form.

Three new Heltzel Bulletins are ready for you . . . B-19, A-20, C-34, having to do with Steel Forms and Portable Batching Bins.

You owe it to yourself, your organization and your post-war construction contracts to have this information at your fingertips. Use the coupon . . . there's no obligation.



HELTZEL SUPERIOR CONCRETE CONSTRUCTION EQUIPMENT

- MILITARY HIGHWAY FORMS
- AIRPORT FORMS
- CURB, CURB AND GUTTER OR SIDEWALK FORMS
- PORTABLE AGGREGATE BATCHING BINS — 30 TO 100 TONS CAPACITY
- PORTABLE AND SEMI PORTABLE BULK CEMENT BATCHING BINS FROM 100 TO 750 BBLS. CAP.
- CENTRAL MIXING PLANTS
- CEMENT TANKS TO 1500 BBLS.
- TREMIE CHUTING
- CONCRETE FLOOR HOPPERS
- CONCRETE BUCKETS

HELTZEL STEEL FORM & IRON CO. WARREN, OHIO · U. S. A.

State Highway Shop Is Departmentalized

Arizona Has Large Shop at Phoenix, Well Laid Out and Each Service Has Own Area Without Crowding

(*Photos on page* 1 *and* 64)

✦ THE well-planned highway equipment shops of the Arizona Highway Department are located adjacent to the Santa Fe Railroad, only two blocks from the State Capitol and immediately back of the Department offices. Built from the designs of the Bridge Division, it has a structural steel frame, a saw-tooth roof with adequate lighting from the roof windows, galvanized iron sides and roof. The 175 x 205-foot building is unusually well laid out for the departmentalized servicing operations. Adjacent buildings serve such functions as office, sign shop, paint shop, cleaning rack and grease rack.

The Phoenix Shop, completed in its present shape in 1940, is part of a statewide system of shops designed to keep the equipment of the State Highway Department, and the State Highway Patrol, in the best of condition and to prolong its useful life. The main shop is equipped to build and overhaul all equipment, while the shops at Tucson, Douglas, Ashfork and Holbrook are equipped to do all major overhauls, and the shops at Prescott, Kingman, Flagstaff, Showlow, Miami, Safford and Jacobs Lake are for the maintenance of highway equipment only.

The shops are operated by the Equipment Division under the Superintendent of Equipment, and all equipment is furnished to State Highway Department projects and districts on a rental basis, the rates being fixed to cover the cost of repairs, depreciation and administrative expense of the Equipment Division. The purchases of equipment for the fiscal year ending June 30, 1942, were as follows:

Outside purchases	$239,028.52
Shop Built	24,145.02
Total New Equipment	$263,173.54

The repairs to equipment in this same period amounted to $366,669.45.

Some Shop Products

A rough idea of the character of the aids to highway construction and maintenance produced at the Phoenix shops may be secured from the paragraphs below. The shops have never been used to compete with manufacturers, but merely produce those items that were special or where used materials could be again placed in service. At the present time the value of the skills of the men in the shops is inestimable, when new equipment cannot be purchased at any price.

In a burst of enthusiasm, many miles of shrubs were planted along highways leading into Phoenix which add greatly to the attractiveness of the roadsides, and in more than one case screen less attractive vistas. Since Phoenix is in the center of a very dry area depending on irrigation for the flourishing crops one now sees along the roadsides, the shrubs have had to be watered regularly to sustain life. This has taken a considerable portion of the $40,000 annually appropriated for the care of roadsides. One measure to reduce the cost of this care was the equipping of an old truck chassis with a huge water tank made from a salvaged corrugated-metal culvert. A 25-foot section of 60-inch pipe was equipped with dished heads at each end and suitable pipe connections for filling and distributing the water at a very low cost. This planting practice was subsequently discontinued and now only desert growth which requires no irrigation is used.

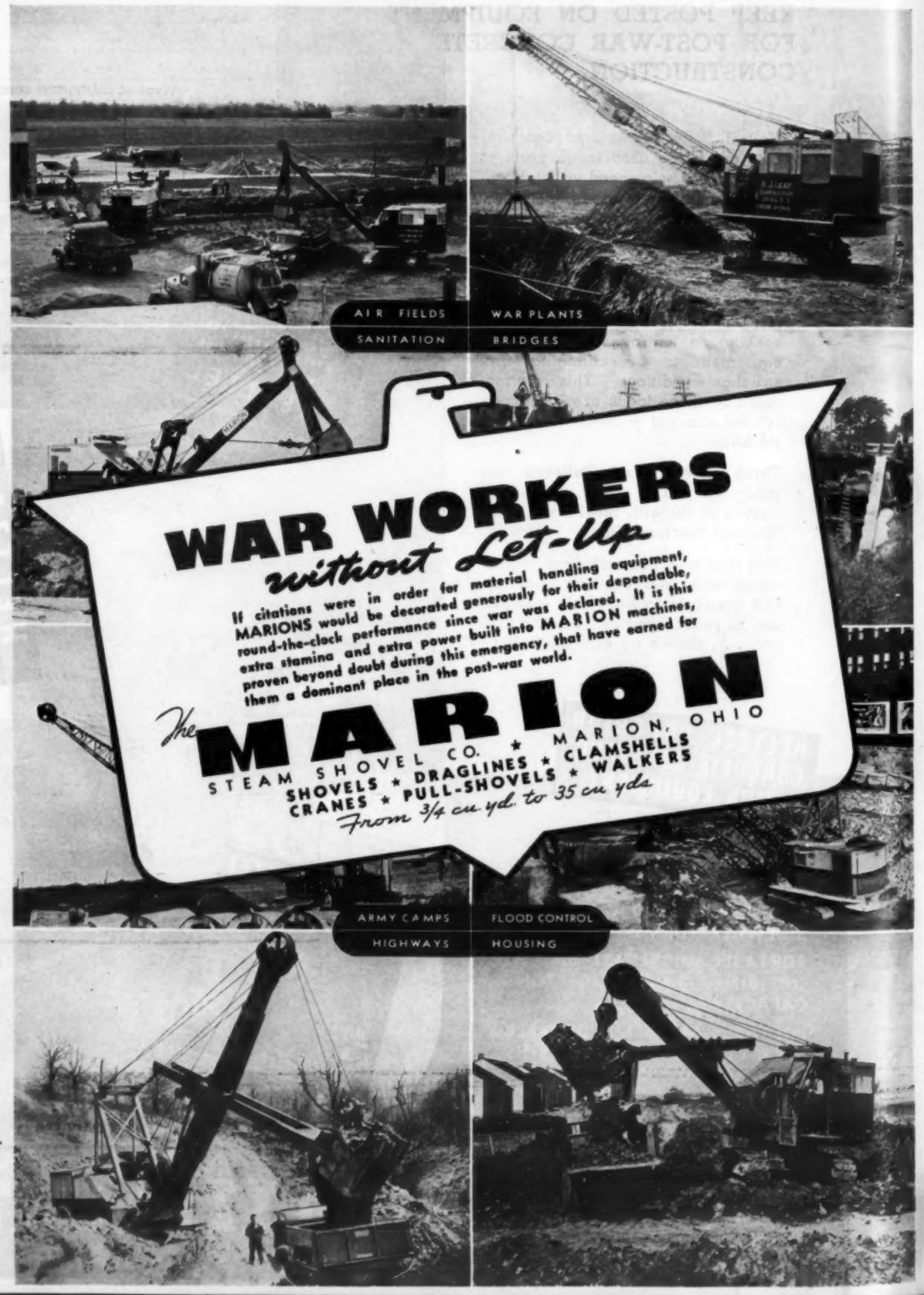
In order to speed the operations of the field mechanics, a number of special heavy-duty pick-ups were designed and constructed in the Phoenix shop. These units were rigged with 4-inch I-beam trolleys for Coffing hoists so that the rail could be run out over the end of the trucks to pick up engines and other heavy parts in the field, for repairing or hauling into the shops. These units are also equipped with special bins for the mechanics' tools and repair parts. The bins are padlocked against loss of small.

C. & E. M. Photo

A Walter truck equipped with a large water tank, made in the Phoenix shops of the Arizona State Highway Department from a corrugated metal culvert pipe.

(*Concluded on page* 58)

TRANSITS and LEVELS
HEADQUARTERS for REPAIRS—any make
We will buy or trade in old Transits, Levels, Alidades, etc. Send instruments for valuation.
Write for new Catalog EC-87 of Engineering Instruments, Engineering Field Equipment and Drafting Room Supplies.
WARREN-KNIGHT CO.
Mfrs. of Sterling Transits & Levels
136 N. 12th St. • Philadelphia, Pa.


AIR FIELDS
WAR PLANTS
SANITATION
BRIDGES
WAR WORKERS
without Let-Up
If citations were in order for material handling equipment, MARIONS would be decorated generously for their dependable, round-the-clock performance since war was declared. It is this extra stamina and extra power built into MARION machines, proven beyond doubt during this emergency, that have earned for them a dominant place in the post-war world.
The MARION
STEAM SHOVEL CO. ★ MARION, OHIO
SHOVELS ★ DRAGLINES ★ CLAMSHELLS
CRANES ★ PULL-SHOVELS ★ WALKERS
From 3/4 cu. yd. to 35 cu yds
ARMY CAMPS
FLOOD CONTROL
HIGHWAYS
HOUSING

The new D Tournapull, Q Carryall, and a Tiltdozer combination unit being used at an Eastern Air-Borne Engineer Training Center.

New Graphite Package Aids in Proper Use

The trend of pre-war labeling of packages, so the user could quickly and instantly grasp the service values and uses of the product, made considerable progress before many repackaging programs were beset with difficulties in obtaining packaging materials because of the war. The Joseph Dixon Crucible Co., Jersey City, N.J., had started on such a course prior to the war and has been successful in placing on the market a few new packages with informative labeling and containing certain sizes of their dry lubricating flake graphites.

Dry lubricating graphite falls into that group of materials, the uses of which are obvious principally to the mechanically experienced or technically trained, but at times even the practical shop man overlooks many service values or possible uses for graphite which easily could serve effectively in meeting some extraordinary lubrication problem.

Attached to the back panel of the new container, which shows eight large, clear, realistic pictures of primary uses of Dixon graphite, is a thirteen-page booklet titled, "New Graphite Know-How Package" which explains in practical, realistic terms the numerous important applications of graphite in addition to giving other helpful directions for using it in combination with other ingredients. To promote further service, there is a tear-out inquiry page, designed to be returned by the user to the manufacturer for information concerning some sixty-six other products of the company.

Using Consolidated Clays For Roadways and Runways

Engineering Experiment Station Bulletins Nos. 70 and 71, recently issued by the School of Engineering, A. & M. College of Texas, deal with the use of clay soils for roadways and runways. The foreword points out that non-uniform volumetric changes in clay soil often cause objectionable riding surface irregularities to develop in overlying pavement. Further, volumetric changes in clay soils often are caused by moisture content fluctations, but it is known that the consolidation of soils is now being used as one means of controlling volumetric changes. Construction contracts that embody consolidation usually call for the soil to be compacted to a specified density measured in pounds per cubic foot of dry soil.

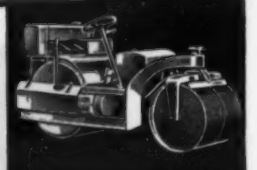
In an endeavor to use this method of stabilization to the best advantage, the two bulletins referred to have been published as a result of extensive tests on the relations between density, moisture content, and volumetric change, particularly when specimens are at their extreme moisture conditions, that is, oven-dry and water-saturated.

Copies of these two bulletins may be secured gratis from the Texas Engineering Experiment Station, College Station, Texas, by highway and airport engineers.

C. H. & E. CONSTRUCTION EQUIPMENT

Three Ton Tandem Roller

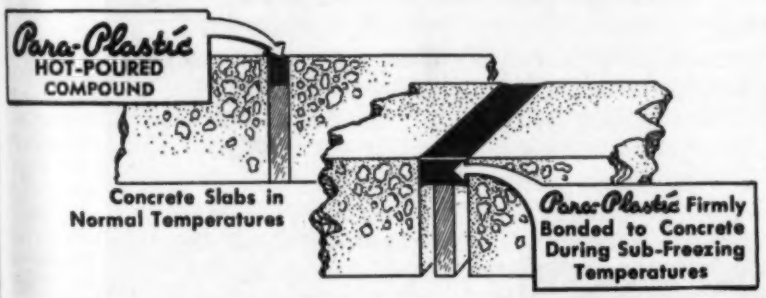
For paint work. Operates same as automobile, slow forward and reverse speed, controlled by one hand lever. Both front and rear rolls can be filled with water. Easy to load on a truck for transportation from job to job. Write for Bulletin 3910 N, Palmer St.



C. H. & E. Manufacturing Co.
Milwaukee, Wis.

Para-Plastic

HOT-POURED RUBBER-LIKE WATERPROOF SEALING COMPOUND


Para-Plastic HOT-POURED COMPOUND
Concrete Slabs in Normal Temperatures
Para-Plastic Firmly Bonded to Concrete During Sub-Freezing Temperatures

Widely recognized and formerly known as Para-Plastic Hot-Poured Rubber Sealing Compound, "the effective waterproof seal"—Servicised has recently developed a VICTORY PARA-PLASTIC after many months of experimental research.

VICTORY PARA-PLASTIC is composed of non-critical materials, (containing no rubber) and fully conforms with Federal Specifications SS-F-336 covering a hot poured sealing compound; as well as Civil Aeronautics Association Specifications No. P-605

VICTORY PARA-PLASTIC bonds firmly with concrete, steel or wood, and serves as a joint or crevice sealer against infiltration of water. This material is not affected by ordinary extremes of summer or winter weather.

Specify VICTORY PARA-PLASTIC Hot-Poured Rubber-Like Sealing Compound as your water proof protection in general construction.

EXPANSION JOINTS

Servicised also is the only manufacturer of four different available types of Expansion Joints known as Asphalt Joint, Fiber Joint, Cork Joint and Self-Expanding Cork Joint. These Expansion Joints are extensively used in construction of Airport Runways, Highways, Tunnels, Bridges, Dams and other construction.

SEWER PIPE JOINTING COMPOUNDS

In addition, Servicised manufactures several types of waterproof Sewer Pipe Jointing materials namely; TUFFLEX—a cold premixed (adhesive and cohesive) plastic troweling compound;—HOT-POURED COMPOUND—for vitrified clay pipe; and PREMOULDED SEWER PIPE BELT—a belt shaped material that is caulked between bell and spigot of sewer pipes.

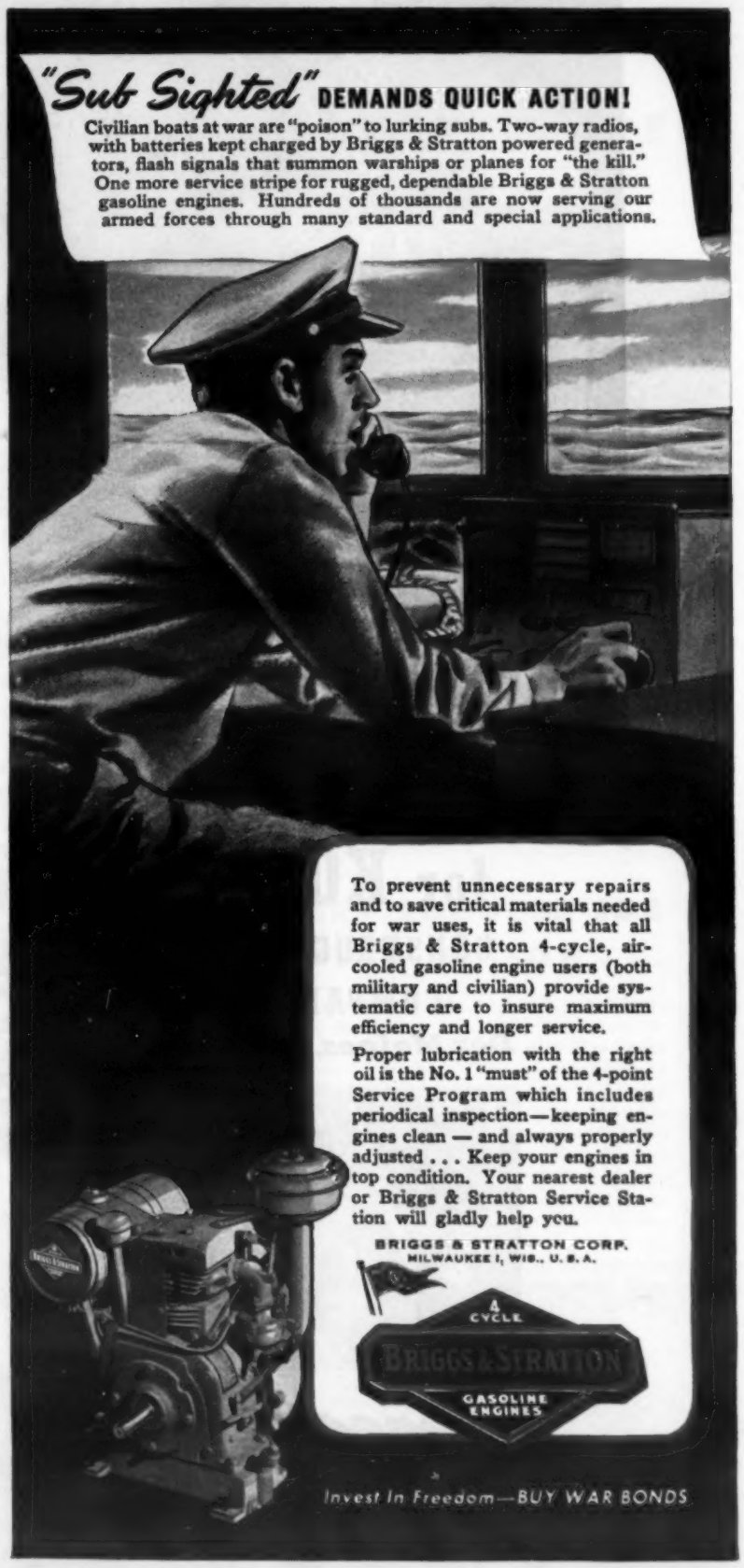
ENGINEERS:

Additional information and Specifications on any of the above products will be furnished you upon request.

SERVICISED PRODUCTS CORP.
6051 West 65th Street, Chicago, Ill.

"Sub Sighted" DEMANDS QUICK ACTION!

Civilian boats at war are "poison" to lurking subs. Two-way radios, with batteries kept charged by Briggs & Stratton powered generators, flash signals that summon warships or planes for "the kill." One more service stripe for rugged, dependable Briggs & Stratton gasoline engines. Hundreds of thousands are now serving our armed forces through many standard and special applications.



To prevent unnecessary repairs and to save critical materials needed for war uses, it is vital that all Briggs & Stratton 4-cycle, air-cooled gasoline engine users (both military and civilian) provide systematic care to insure maximum efficiency and longer service.

Proper lubrication with the right oil is the No. 1 "must" of the 4-point Service Program which includes periodical inspection—keeping engines clean — and always properly adjusted . . . Keep your engines in top condition. Your nearest dealer or Briggs & Stratton Service Station will gladly help you.

BRIGGS & STRATTON CORP.
MILWAUKEE I, WIS., U. S. A.

4 CYCLE BRIGGS & STRATTON GASOLINE ENGINES

Invest In Freedom—BUY WAR BONDS

War Still Absorbs Crane-Shovel Output

Practically the entire estimated output of the power shovel and crane industry up to the close of 1943 will be absorbed by military orders, according to the Industry Advisory Committee, with the exception of certain sizes of equipment needed in mining, logging, and other essential civilian work. The Committee states that used equipment should take care of most other civilian requirements if full utilization is made of all available supplies.

All the armed services have placed their orders for the remainder of 1943, and the Army has also placed orders covering its requirements for the first six months of 1944. Other claimant agencies are being asked to make known their needs for the first half of 1944 insofar as possible.

International Bridge

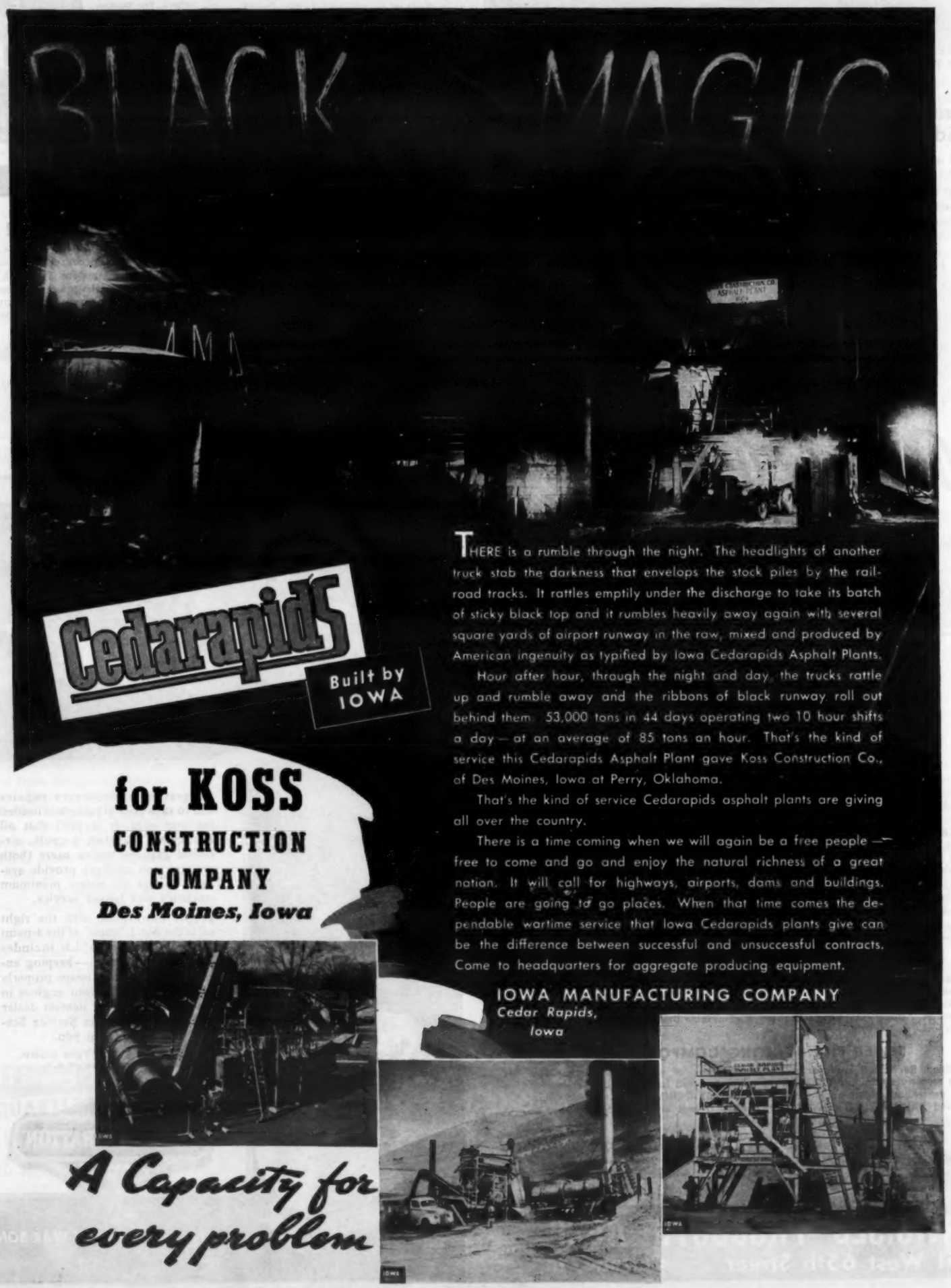
At the junction of the Trans-Andean Highway with the Tachira River, which marks the frontier between Venezuela and Colombia, stands a symbol of the cordiality and understanding between these two nations. This is the Bolivar International Bridge, built to carry the Pan-American Highway from Bogotá to Caracas. Proof that the bridge stands as a symbol of good will and friendship between the peoples of these two American republics is found in two small parks which flank the approaches to the bridge.

At the eastern end of the bridge, enthusiastic Venezuelans have created a tropical garden, to which they have given the name, "Parque Colombia," and their neighbors at the western end of the structure, not to be outdone, have laid out a similar garden spot, which they call "Parque Venezuela".

New Coast Manager For Atlas Giant Div.

J. C. Costello has been appointed Manager of the Giant Division sales offices of Atlas Powder Co. of Wilmington, Del. Mr. Costello, whose headquarters will be at San Francisco, Calif., succeeds Weston G. Frome, who has become Assistant General Manager of the Explosives Department at Wilmington.

Mr. Costello has been associated with the explosives industry for 34 years, the past 22 of which he has been with Atlas as Assistant Sales Manager and Sales Manager of the Giant Division.



THERE is a rumble through the night. The headlights of another truck stab the darkness that envelops the stock piles by the railroad tracks. It rattles emptily under the discharge to take its batch of sticky black top and it rumbles heavily away again with several square yards of airport runway in the raw, mixed and produced by American ingenuity as typified by Iowa Cedarapids Asphalt Plants.

Hour after hour, through the night and day, the trucks rattle up and rumble away and the ribbons of black runway roll out behind them. 53,000 tons in 44 days operating two 10 hour shifts a day — at an average of 85 tons an hour. That's the kind of service this Cedarapids Asphalt Plant gave Koss Construction Co., of Des Moines, Iowa at Perry, Oklahoma.

That's the kind of service Cedarapids asphalt plants are giving all over the country.

There is a time coming when we will again be a free people — free to come and go and enjoy the natural richness of a great nation. It will call for highways, airports, dams and buildings. People are going to go places. When that time comes the dependable wartime service that Iowa Cedarapids plants give can be the difference between successful and unsuccessful contracts. Come to headquarters for aggregate producing equipment.

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa

for KOSS CONSTRUCTION COMPANY
Des Moines, Iowa

A Capacity for every problem

Snow-Drift Control By Live Snow Fence

(*Continued from page* 21)

by the adjacent property owner to serve the dual purpose of ornamental hedge and fence. During the winter months this barrier produces unnecessary drifting because of its position relative to the traveled way. However, a single-row barrier may be very effective when properly located and maintained.

Michigan reports that there are unlimited possibilities that can be developed in the planting of trees and shrubs for snow-control purposes. A barrier may consist wholly of conifers, or deciduous trees and shrubs, or consist of a mixture of both. The planting may be of such a nature as to blend harmoniously with the surrounding landscape, or it may be badly constructed, containing foreign trees and shrubs that will cause a discord in the scheme of nature which is not pleasing to the passing motorists.

In general, the planting arrangement will depend on:

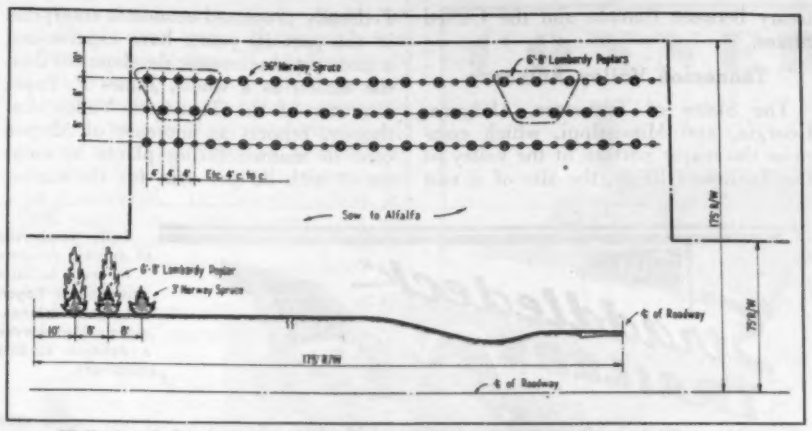
1. The width of the right-of-way, the length of the barrier, and the topography and development of the lands adjacent to the highway.
2. The species of trees to be used and their growth, spread, hardiness and tolerance.
3. Ample spacing for moisture and feeding area for the roots. At the same time the spacing should be close enough to keep down weeds and grass.
4. The age to which the belt will be allowed to grow.
5. The facilities for cultivation and maintenance between the rows and the type of machinery to be used.

We are indebted to Philip Troeger, Landscape Architect, Michigan State Highway Department, for the Michigan data and photograph reproduced with this article.

Snow Control in Minnesota

Minnesota has done considerable work in the streamlining of highway projects. As an example of the effectiveness of this work, and its economy in maintenance, we have the following report from Harold E. Olson, Engineer of Roadside Development, on a highway project completed on July 3, 1940. Mr. Olson states, "The effectiveness of this type of work is well-proven by comparing maintenance costs of this area in 1938, which amounted to $435.29 per mile under the old construction design, to the maintenance costs of the same area in 1941, under the modern streamline road design, which was $338.49 per mile, thereby resulting in a decreased maintenance cost of $96.80 per mile, or a saving of 22 per cent."

The Minnesota Department of Highways is cooperating with the Forestry Department on a reforestation program in which borrow pits and all right-of-way beyond the construction limits are to be planted with native conifer seedlings, including also all backslope areas lying beyond 8 feet from the ditch bottom. This eliminates the necessity of mowing or cutting of weeds on backslopes as the native growth, springing up as established ground covers, acts as a nurse crop for the seedlings and results in a decided saving in maintenance costs.



Methods of planting and thinning out trees for live snow fence in Minnesota.

The accompanying diagram shows the type of work which is now being done in creating live snow fences where abutting property owners are willing to cooperate by furnishing the needed right-of-way, or in areas where the state already has sufficient right-of-way width.

The outer 35-foot strip of the total length of the snow-break is thoroughly plowed and harrowed as early as possible in the season for fire protection and preparation for planting. Lombardy poplars 6 to 8 feet in height are planted in groups of eight at intervals of 100 feet within the two outer rows. All other trees are Norway spruce 36 inches high. The initial planting is indicated by the circles. In thinning, every other tree is carefully removed and used in other locations, leaving the remaining trees 8 feet apart in a staggered formation as indicated by the double circles.

WPB-617 Succeeds PD-200

Form PD-200, the form used to make application for authority to begin construction and for priority assistance, has been replaced by a new form known as WPB-617, the War Production Board has announced.

In addition to the functions performed by the old PD-200 forms, the new WPB-617 constitutes an application for allotment of controlled materials.

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Standard in Concrete Construction for 31 Years
ECONOMICAL and EFFICIENT
Asphalt Joint
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THE PHILIP CAREY MFG. CO.
Dependable Products Since 1873
LOCKLAND, CINCINNATI, OHIO

NEW, Improved ATHEY MOBILOADER

Athey MobiLoader digs its load—travels in reverse to the truck, trailer or fill—discharges the material overhead. Saves turning, saves time and money in its simple "straight-line" economy loading action.

LIGHTER—SIMPLER—SPEEDS EVERY LOADING JOB WITH "STRAIGHT-LINE" LOADING ACTION . . .

SPECIFICATIONS
MODEL W4-1 MOBILOADER
BUCKET CAPACITY 1⅛ cubic yards
Weight, approx. 6150 lbs.
Dumping Height 8 feet
Overall Height, bucket lowered, 7'6"
Overall Height, bucket raised, 16'2"
Operates With "Caterpillar" Diesel D4 Tractor
★

Athey MobiLoaders . . . the new, time-saving method of loading materials . . . have been proved by hundreds of contractors, municipalities, mines and other owners during the past four years. Now, comes an improved Athey MobiLoader that operates on the 35 h.p. "Caterpillar" Diesel D4 Tractor. It has many advancements in design over its predecessor model, but retains those features which helped Athey MobiLoaders establish such outstanding records of speed and economy in loading.

The Model W4-1 is "streamlined" and greatly simplified . . . has lower center of gravity . . . increased stability . . . improved bucket design . . . reduced height, making it easier to transport from one job to the next. It digs, hauls and dumps its load in "straight-line" action . . . eliminates turning of tractor to discharge load.

MobiLoaders handle general excavating—or stockpile loading of gravel, rock, sand, coal, ore, earth or clay.

Send for the interesting folder showing a production chart on what the Model W4-1 will do. Write Athey Truss Wheel Co., 5631 W. 65th St., Chicago, Ill., for Form 604.

ATHEY MOBILOADERS ★ ★ ★ ★ ★ TRAILERS

Hydro-Power Projects In Post-War Program

(*Continued from page* 35)

and local public agencies, where the Federal interest is involved.

In 1940, the total installed capacity of the hydro-electric power plants of the United States was 11,550,000 kilowatts, and the energy output in 1940 was about 50,000,000,000 kilowatt-hours. If the same load factor is assumed and markets arise in the post-war era to use the power, hydro-electric installations totaling as much as 70,000,000 kilowatts may be entirely feasible. This would mean an extensive construction market, lasting for a period as long as ten years.

The National Resources Planning Board Report for 1943, Part I, Post-War Planning Program, points out that the present plan for the control and utilization of the waters of the main stem of the Columbia River, which will form the backbone of the regional water development program in the Pacific Northwest, includes eleven dams and reservoirs, of which only three—Rock Island, Bonneville, and Grand Coulee—are now constructed. It is estimated that this system alone, including the costs of electric-power transmission, will amount to at least $800,000,000. This system will be supplemented by numerous reservoir projects on the Sanke, Willamette, and other tributary basins. Proposals for at least 75 additional reservoirs are under consideration in this region, and many more will undoubtedly follow further investigation. As plans proceed, some of these will naturally be eliminated for more efficient combinations.

The Bonneville Power Administration alone had a program of enlargement and extensions to its network of power transmission and distribution lines. The long-term program at Bonneville has been changed and speeded up because of war demands, but there still remains over $120,000,000 of projects available for construction.

The St. Lawrence Waterway project, primarily promoted as a navigation project and the subject of much controversy in engineering and financial circles in the United States for many years, still remains on the "shelf" of possible post-war construction projects. The United States and Canadian Governments have already provided 14-foot navigation from the Great Lakes to the sea and 25-foot navigation for a great part of this distance, at considerable expense. Existing plans are for a waterway providing 27-foot navigation from the Atlantic Ocean to all major Great Lakes ports for ocean-going vessels. The development of water power at the International Rapids section is an important feature of this program. The project calls for an installed capacity of 2,200,000 horsepower, which is estimated to produce 13,000,000,000 kilowatt-hours of electrical energy annually, or nearly one third of the total amount of hydro-electric energy generated in the United States in 1941. The entire project, navigation and power development, is estimated to cost about $250,000,000, and has already been implemented by a treaty between Canada and the United States.

Tennessee Valley Authority

The States of Tennessee, Alabama, Georgia, and Mississippi, which comprise the major portion of the valley of the Tennessee River, the site of a vast Federally promoted economic enterprise in the past 10 years, have experienced a more rapid economic development than the nation as a whole. James P. Pope, Director of the Tennessee Valley Authority, reports an increase of 52 per cent in manufacturing plants as compared with 32 per cent for the nation between 1933 and 1939. In this same period, total wages increased 40 per cent or 4 per cent more than the national figure, while per capita income in the four benefited states increased 19 per cent more than the 56 per cent for the entire country.

(*Concluded on next page*)

meet SPECIAL NEEDS

ROGERS BROTHERS CORP., ALBION, PENNA.

Bulky, cumbersome machinery, and of late heavy pieces of defense equipment must be moved from place to place.

In some localities, where low headroom is encountered, this type of Rogers Trailer is used extensively.

Large machines, with crawler treads "straddle" the girders thus lowering the overall height by several inches, a definite advantage also in handling many kinds of equipment.

ROGERS LOW BED HEAVY DUTY TRAILERS

MAXIMUM WORK—MINIMUM COST *with* CLEVELAND PAVING BREAKERS

These husky *Clevelands* pack a mighty wallop—work at top speed—but take it easy on air consumption. And from the Cleveland paving breaker line you can select the *right* tool for *every* job:

C7 (80 lbs.) is best for average work. Two C7's run from a No. 85 compressor.

C9 (82 lbs.) is a slugger, suitable for reinforced, well-seasoned concrete. A No. 85 compressor operates two.

C10 (35 lbs.) is a smaller tool for light work, trimming, etc. Three C10's run from a No. 85 compressor.

C11 (58 lbs.) has a long stroke and strikes a heavy blow. Very economical air consumption.

The "Clevaloy" line includes a wide range of chisels, moils, and other tools.

Ask for Bulletin 128 on Cleveland Paving Breakers.

BUY U. S. WAR BONDS AND STAMPS

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THE CLEVELAND ROCK DRILL COMPANY
Division of The Cleveland Pneumatic Tool Company
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LEADERS IN DRILLING EQUIPMENT

SLOPE-METERS SPEED VICTORY

Automatic Slope-Meters are in use on the construction of airports, dams, building sites and highways. Slope-Meter is a compact, sturdily constructed instrument that is attached in a spot convenient to the operator and will automatically show the exact grade or slope on which the machine is working.

Order From Your Equipment Distributor Today

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TVA Construction Plans for the Future

(*Continued from preceding page*)

That the Tennessee Valley has been an economic success as a whole has been debated, as it represents Federal money expended on construction by force account rather than by open bidding and contract. Further, it is stated that much of the development would have occurred through private enterprise, thus creating greater taxable values to the benefit of the nation rather than creating non-taxable Federal properties at the expense of the nation.

Leaving these controversial points out of the picture for the present, it must be admitted that the future program of TVA construction offers great potential employment opportunity and a large market for construction equipment, whether the work is done by contract or a continuation of the force-account system. Already TVA has completed thirteen dams and has three more under construction, and has placed 1,000,000 kilowatts of power-generating equipment in service. This has improved navigation, controlled floods, and increased industry in the Valley.

Post-war plans of TVA include seven dams for flood control and no announced additional power projects. The new dams will control the flow of the streams in the Upper Broad River Valley in North Carolina and furnish flood protection for Asheville, Marshall, and Canton, N. C., as well as protect a number of industrial plants and farm land in that area.

The Office of the Chief Engineer, Clarence E. Blee, has furnished the following statement of the post-war program of TVA for readers of CONTRACTORS AND ENGINEERS MONTHLY.

"Since July, 1940, the Tennessee Valley Authority has been engaged in an accelerated engineering and construction program for the war. This program has been and is our primary consideration. Five large dams and one steam plant authorized after July, 1940, have been completed and are now in operation. These projects were part of three emergency supplemental Congressional authorizations. The Authority recently completed the $36,000,000 Douglas project in the record time of 13 months after the date of authorization and has under construction, on accelerated schedules, at the present time four major water-control projects, including the $105,000,000 Kentucky project near Paducah, Kentucky, and the $60,000,000 Fontana Dam in North Carolina.

"In addition to the primary responsibility involved in this accelerated construction and engineering program, the Authority is studying important problems which must be faced in this area during the post-war period. Certain projects have been authorized by Congress but deferred indefinitely by order of the War Production Board. These deferred projects, totaling $106,000,000, may quite appropriately be included in the post-war program of construction as they fit into and are a part of the plan for the development of the Tennessee Valley. Also they are projects which could be started immediately upon cessation of hostilities."

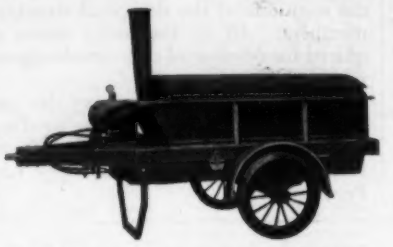
Fewer Cutting Edges For Snow Plow Blades

The Snow Plow Industry Advisory Committee met with officials of the War Production Board in Washington recently to study the possibility of simplifying specifications and reducing the number of types and sizes of cutting edges for snow plows. At present the cutting edges manufactured conform to over four hundred variations in specifications.

Among the suggestions made for standardization were: The manufacture of two standard sizes, ½ x 6 inches and ½ x 8 inches; the use of a standard carriage bolt; all bolt holes to be square and to be placed in conformation to agreed-upon patterns; to abandon all beveled edges and adopt the square edge as a standard. In connection with the last suggestion, it was pointed out that use of the cutting edge quickly beveled it and that beveling by mill work was unnecessary.

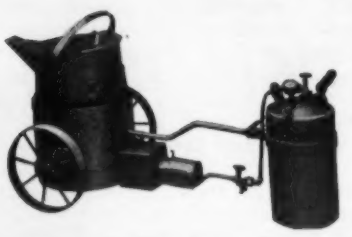
A government official reported that his office had canvassed all state, county, township, and municipal highway agencies on the question of how much snow-plow equipment they would need for the winter of 1943-44. On the returns from approximately 80 per cent of those canvassed, it was estimated that these agencies would need about 1,745 tons of steel or 60 per cent of last year's requirements, in the form of cutting edges. This estimate was considered low by members of the Committee, who requested a re-check by WPB.

CONNERY'S HEATING KETTLES



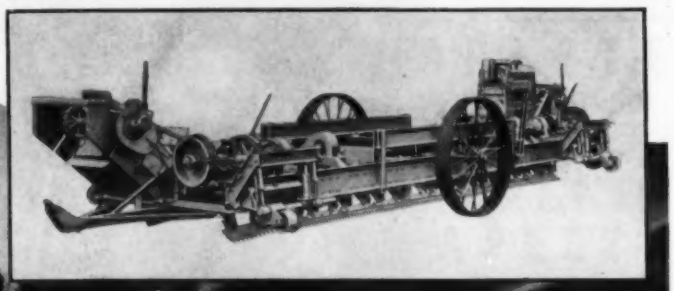
Speed up work by using a Connery Heating Kettle for building and maintaining highways, airports, barracks and roads. Made in sizes of 30, 80, 110 and 165 gallons.

Send today for our complete catalog showing our full line of Tar and Asphalt Heating Kettles, Spraying Attachments, Pouring Pots, etc.



CONNERY CONSTRUCTION CO.
4000 N. Second St. Philadelphia, Pa.

HERE'S THE MACHINE



RB POWER FINEGRADER

THE R-B Power Finegrader, for fast, accurate preparation of subgrade, steps in and fills a gap in otherwise completely mechanized paving jobs. It performs, among others, these important services:

Saves Labor—*operated by one man, the Finegrader eliminates nearly all hand labor on the grade.*

Eliminates Delays—*with the R-B Finegrader, the prepared grade is always well ahead of the paver. On many jobs R-B's have kept out in front of two 34-E pavers, paving as much as 350 lineal ft. per hour.*

Saves Material—*accurate subgrade reduces loss of yield to a negligible percentage.*

No modern road or runway paving job is complete without an R-B Power Finegrader. Write for bulletin today.

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Built by Buckeye

Compact Book on Design Of Reinforced Concrete

A 249-page book, "Simplified Design of Reinforced Concrete", has just been published under the authorship of Harry Parker, Professor of Architectural Construction, University of Pennsylvania. Professor Parker, who is the author of several books prepared especially to simplify the problems of engineering and design, has produced a volume which is complete, requiring from the user only a preliminary knowledge of mechanics.

The book is designed for home study as well as for a textbook and contains numerous illustrative examples giving the solutions of the design of structural members. All of the usual tables required for reinforced-concrete design are included.

This compact volume may be purchased through this magazine or direct from the publisher, John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price: $2.75.

Sullivan Personnel Changes

Announcement has been made by the Sullivan Machinery Co., Michigan City, Ind., of the resignation of John W. Haddock, Vice President in charge of engineering and sales, to become President of the Farrel-Birmingham Co., Ansonia, Conn. Mr. Haddock had been associated with Sullivan for more than 20 years.

Two recent promotions in the Sullivan company include the appointment of O. J. Neslage as General Sales Manager and J. N. Rolston as Assistant General Sales Manager. Mr. Neslage has served as Manager of the company's Mexico City, Joplin, Salt Lake City and New York territories, and Mr. Rolston has been with Sullivan for 13 years, including 5 years as Assistant General Manager of the company's Canadian subsidiary.

Speed up steel production by turning in all your scrap. If you can't use it, scrap it!

"Let us have faith that right makes might and in that faith let us dare to do our duty as we understand it."
—Abraham Lincoln.

Independence Day, 1943

"I remember a Fourth of July night not so many years ago, when a little fellow said: '*Thanks for those swell fireworks, Pop.*'

"Today, I bought that boy more fireworks — real fireworks — by purchasing war bonds to help him blast the Axis into kingdom come. For he's a grown man now, and out there fighting for the right to have an Independence Day. So I'll buy him more fireworks today and every day, until he comes back home again. Why don't you do the same? Invest your dollars in war bonds!"

Rodgers Hydraulic Inc., St. Louis Park, Minneapolis, Minnesota.

HYDRAULICS Rodgers KEEP THE WORLD MOVING

Manufacturers of:
UNIVERSAL HYDRAULIC PRESSES
TRACK PRESS EQUIPMENT
HYDRAULIC KEEL BENDERS
HYDROSTATIC TEST UNITS
POWER TRACK WRENCHES
HYDRAULIC PLASTIC PRESSES
PORTABLE STRAIGHTENER FOR PIPE AND KELLYS

Rodgers HYDRAULIC Inc.

Make Wire Rope Do Double Duty

Shifting Cable from One Service to Another Will Extend Its Working Life And Save Steel

MUCH wire rope is discarded after a certain length of service because part of it has worn or deteriorated until it is unsafe. Yet the remainder of the rope, which may be as much as 90 per cent of the length, is in first-class condition. If maximum service could be obtained from every foot of rope, a considerable saving would be realized, and the large tonnage of steel thus conserved could be applied to other uses. This is especially important in this day of priorities and critical materials.

Among cable-operated equipment to which methods of rope conservation have been successfully applied are grab-bucket cranes, power shovels, dirt-moving scrapers, and power drag scrapers.

When the rope must operate over small sheaves and drums, as is the case in most equipment of the types mentioned. preformed rope is often preferred because of its high resistance to fatigue, with resulting increase in service life. However, any method of increasing rope life through utilizing, as far as practicable, all the potential service remaining in the rope, is as appliable to any type of rope.

The most common methods of squeezing the last drop of service out of wire rope, without sacrificing safety, are summarized below.

When the greatest wear occurs at or near the end of the rope, one of the following methods, or a combination of them, will result in considerably longer rope service:

(1) When the end becomes worn, crop it off, and continue to use the remaining length of good rope. This requires a rope of extra length to begin with, the surplus being wound on the drum and of sufficient length to allow as many end croppings as feasible.

(2) Before the end is so badly worn that it must be discarded, turn the rope end for end, thereby bringing a good section of rope at the point of greatest wear.

(3) Crop off the worn end, and in its place substitute a good rope of the same length by splicing or clamping it to the end of the original rope. This splice can be renewed time after time until the original rope is ready to be discarded.

Where wear is largely confined to one or more separated points along the rope (such as at the sheaves of a dirt-moving scraper where the greatest load is being applied or at the points of crossover in each layer on a multi-layer drum), rope life can be increased by cutting off a few feet at the drum end or letting out several extra feet of rope through the drum eye. By thus shifting the rope, the points of wear fall at other places on the rope.

When a rope is no longer serviceable in its specific location, the seriously damaged sections might be cut out of the rope and the remainder used on some other application. Many such ropes, if still in first-class shape, are cut to proper length and used as slings. However, a rope showing appreciable wear should never be used as a sling, for reasons of safety. Another example is the use of grab-bucket closing lines, shortened by cropping off the damaged ends, as holding lines or tag lines on the same crane.

The practice of using discarded wire rope as fencing and as guards should be discontinued for the duration of the war, and materials substituted that are less essential to war production and more readily obtainable.

Specific Ways to Extend Wire Rope Life

Equipment	Description of Rope	Where Damage Occurs	Remedy to Increase Life
Grab Bucket	Closing Line	At small sheave in closing mechanism.	Use rope of extra length and cut off damaged section at bucket end. When rope is too short to crop, it can be turned end for end, or a short length of new rope can be spliced on at bucket end.
Dipper Shovel	Hoist Line	Around dipper sheave when shovel is taking bite; also at padlock end.	Crop off 2 or 3 ft. at padlock end. Turn rope end for end when too short to crop.
Dragline Excavator	Drag Cable	At fair lead.	Turn end for end.
Carry Scrapers	All Ropes	At sheaves and drums	Use extra length rope with surplus carried on spare reel on scraper. Crop off 6 ft. at power unit and after each day's run.
Power Drag	Inhaul and Outhaul Cables	At sheaves and at scraper end.	Crop off 15 to 25 ft. at scraper end.

Boom cables on cranes and draglines are customarily replaced while still in fairly good shape, as an extra insurance against any possibility of dropping the boom. These cables are then sometimes used as hoisting cables on the same or similar equipment and as drag and trip cables, as well as in other services where life and property would not be endangered by breakage of the cable.

Before applying used cable, the mechanic should make sure that the cable diameter will fit the sheave groove. Too large or too small a cable will cause unnecessary wear on the sheaves and will require their repair or replacement before a new cable is installed.

P & H Field Men Hold Conservation Clinic

How to conserve critical materials and parts by better maintenance of excavators is the main subject of a special series of six-week clinics being attended by all P & H field representatives at the Harnischfeger Corp. plant at Milwaukee, Wis. This clinic is part of the company's program to help customers meet wartime demands upon digging and loading equipment by keeping it operating at peak efficiency.

With the availability of replacement parts seriously threatened by manufacturing restrictions and necessary diversion of steel to primary war purposes, the most effective maintenance routines must be adopted by operators to prevent excessive lay-up of machinery. The field men are being given an intensive refresher course in modern operating and maintenance methods, as well as in reclamation of old equipment to aid them in working with excavator owners and operators in such problems. Recognizing the vital role which old as well as new machines are playing in the war program, the company has recently transferred several widely experienced field men to the Home Office Repair Order Division, as a further aid in service to its customers.

In addition to its line of excavators, crawler and carrier-mounted cranes, Harnischfeger Corp. manufactures P & H electric hoists and overhead traveling cranes and a complete line of ac and dc welders and welding electrodes.

Army-Navy "E" Awards

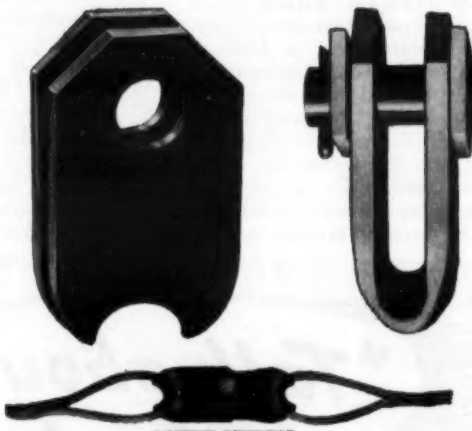
Among the companies well-known in the construction-equipment and material field to receive Army-Navy "E" Awards recently are the following: Cleaver-Brooks Co., Milwaukee, Wis.; Climax Engineering Co., Clinton, Iowa; the Berlin Works of E. I. du Pont de Nemours & Co.; I. F. Laucks, Inc., Seattle, Wash.; Mall Tool Co., Chicago, Ill.; D. W. Onan & Sons, Minneapolis, Minn.; and Universal Engineering Co., Cedar Rapids, Iowa.

The White Star, symbolic of renewal of the Army-Navy Production Award, has been bestowed on the Stewart-Warner Corp., Chicago, Ill.

COMPLETE
WELL POINT SYSTEMS
WILL DRY UP ANY EXCAVATION
Faster—More Economically
Write for Job Estimate and Literature
COMPLETE
MACHINERY & EQUIPMENT CO., Inc.
Dept. C
36-40 11th St., Long Island City, N.Y.
Tel. IRonsides 6-8600

and now! the GARBRO SHIMBLE

The new GAR-BRO SHIMBLE is a wire rope fitting that is both a SHackle and a thIMBLE. No special connection required—just clip or splice a loop in the end of a rope and slip the rope over the SHIMBLE.
This new device has a multitude of uses in the construction and industrial field. The GAR-BRO SHIMBLE gives better rope protection than any shackle and thimble combination you can buy. Increase your rope efficiency and economize by using GAR-BRO SHIMBLES on all your cable hook-ups.



Gar-Bro SHIMBLES are forged from structural steel bars thereby permitting welding to other attachments or bending of side plates to fit special conditions. The photograph at right shows the application of an open SHIMBLE and a CLOSED SHIMBLE to the boom topping hog-cable on a crane. There are many other applications —too numerous to mention here.

PATENT PENDING

GAR-BRO DISTRIBUTORS

Edward R. Bacon Company . . . . . San Francisco, California
Garlinghouse Brothers . . . . . Los Angeles, California
Loggers & Contractors Machinery Co. . . . Portland, Oregon
A. H. Cox & Company . . . . . Seattle, Washington
Construction Equipment Company . . . Spokane, Washington
Intermountain Equipment Company . . . . . Boise, Idaho
Arnold Machinery Company . . . . . Salt Lake City, Utah
Contractors Equipment & Supply Co. . Albuquerque, New Mexico

Manufactured by... GARLINGHOUSE BROTHERS
2416 EAST 16TH STREET, LOS ANGELES 21, CALIFORNIA

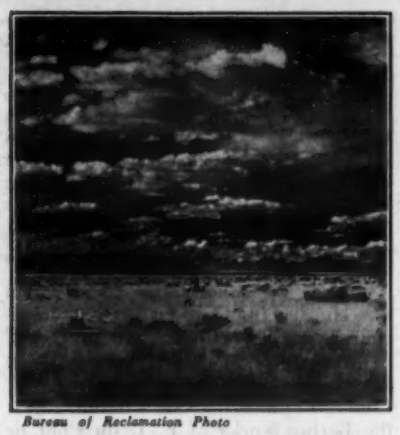
RUD-o-MATIC TAGLINE

A FOOL-PROOF TAGLINE

The Rud-o-Matic Tagline is operated on a spring principle and maintains at all times a positive tension sufficient to steady a clam shell bucket under any and all conditions, and will operate perfectly with the boom at any angle. It eliminates all the grief usually encountered with the average tagline as there are no weights, tracks, pins, carriages, or sheaves to wear out or to get out of order. Because of the large bearing and fewer sheaves, the saving on cable alone would eventually pay for it.

Tagline is complete with fair lead and cable attached and can be installed in less than one-half hour. Most of the crane manufacturers have adopted the Rud-o-Matic as standard equipment.

Manufactured by
McCaffrey-Ruddock Tagline Corp.
2121 E. 25th St., Los Angeles



Bureau of Reclamation Photo

The largest of the Bureau of Reclamation's proposed post-war projects will transform 1,200,000 acres of arid but highly fertile land in the Columbia Basin, Wash., into a prosperous farm community.

Big Irrigation Program Needed After the War

(*Continued from page* 19)

the estimated cost of projects involved in surveys now under way or authorized for flood control; a total of $832,216,379 as the estimated cost of projects requiring future Congressional authorization; and $666,820,283 as the estimated cost of authorized projects or those requiring only Presidential authorization to be undertaken. These three categories total $1,999,036,662.

Irrigation

The constructive program for developing the great arid areas of the West for the production of food for America was checked by the war. Project after project was closed down by WPB to conserve material and manpower. Fortunately, wiser heads prevailed, and a number of projects were later removed from the "shut down for the duration" list and were continued. Earnest minds had urged the completion of all projects already started, as a bulwark against unfavorable weather conditions, possible losses of food-stuffs at sea, and the need for feeding the hungry millions, released progressively from the yoke of the Axis occupation and domination. As a measure for winning the peace, there is no activity to which we should accord more aid through the materials allotted to civilian use than to the completion of construction of the great irrigation projects of the West as buffers against lack of food for the post-war world.

Grover B. Hill, Under-Secretary of Agriculture, testifying at a hearing before the Appropriations Committee of the House in Washington, said that the food shortage is serious in this country and that the shortage was possibly more acute on the West Coast due to the influx of war industries and workers. Secretary Ickes told the Appropriations Committee that his Department, in urging sharp reductions in appropriations for next year, had still made efforts to increase food production.

"We are under obligation to increase food production, and substantial increases can be obtained through completion of twenty-three irrigation projects of the Bureau of Reclamation that were under way but which are now halted," Mr. Ickes said. "The Bureau is prepared to initiate construction on new projects —thirty-nine in all—which by 1945 could supply water to 1,678,877 acres in fifteen states."

Bureau of Reclamation Reports

The Bureau of Reclamation, in response to an inquiry addressed to it by CONTRACTORS AND ENGINEERS MONTHLY, has furnished the following detailed statement of its post-war construction program:

"The Bureau of Reclamation, so far as war conditions permit, is developing a post-war construction program of irrigation and multiple-purpose projects, including power installations, in the seventeen states bisected by or west of the 100th meridian. The program includes:

(a) Uncompleted work on 25 projects where construction has been retarded or halted by the War Production Board;

(b) Four large new projects which were authorized before or early in the war but where work was not started, and for which structural designs can be quickly completed;

(c) A shelf of fifty projects for which blueprints will be ready and where work can be quickly launched.

"The tentative total of 79 projects now included in the Bureau's post-war public-works program may be increased if available funds and personnel permit the completion of field investigations, designs, and other work. Some of the field work involves basin-wide surveys in cooperation with other Federal agencies.

"Appropriations by the Congress provide the funds for investigation and planning of new projects. For the fiscal year ending June 30, 1943, a total of $1,399,750 was appropriated for this purpose. The President recommended $1,200,000 for the work for the coming fiscal year; however, the Interior Appropriation Bill for 1944 as it passed the House of Representatives reduced this amount to $575,000. An effort is being made to restore the amount recom-

(*Concluded on next page*)

WILLIAMS *Buckets*
ARE BITING INTO FROZEN GROUND and TROPIC MUCK

● Williams Buckets are very much in active service in the wide-flung war offense. Concrete-hard, frozen ground is being broken by the sharp teeth of Williams Buckets in far north road building. Deep in jungles Wellman Buckets are digging and dredging. At ore mines, over stock piles and railway cars, and in steel mills Williams Buckets are literally moving mountains to help beat the Axis.

built by
THE WELLMAN ENGINEERING COMPANY
7012 Central Avenue • Cleveland, Ohio

How do you pick hard-facing rods—by how much they cost—or how long they last?

THERE'S more than initial cost to consider in buying hard-facing alloys for protecting buckets, bucket lips and other construction equipment from excessive and damaging wear.

Initial price of rods is not important since it costs as much to apply a cheap rod as the best that money can buy, and the difference in rod costs compared to total cost of the job is negligible. Of far greater importance is the length of service you can expect from a part after hard metal has been applied... or the number of cubic yards of material handled before reconditioning becomes necessary. This service life directly governs the cost per hour of equipment operation and there is a vast difference between the life expectancy of the best hard-facing rod and the cheapest.

No other rod can compete with Stoody Self-Hardening for certain applications on manganese parts. Not only is Stoody Self-Hardening exceptionally easy to apply, forming an excellent bond with manganese, but it represents the ultimate in resistance to impact and abrasion. The price: 50c per pound f.o.b. Whittier, California. Priority requirements are AA-4 or higher. A trial order of 100 pounds of Stoody Self-Hardening will prove the merits of this alloy on such parts as: Roll Crushers, Jaw Crushers, Swing Hammers, Grizzlies, Sand Pump Impellers and Casings, Baffle Plates, Shaker Pans, etc.

STOODY COMPANY
1136 Slauson Avenue • Whittier, California

STOODY HARD-FACING ALLOYS
Stop wear . . . Eliminate Repair

"It's certainly a snap to haul materials in Sterlings. Lucky the boss has a slew of 'em on hand."

Men naturally prefer Sterlings because of their well-balanced construction and easy wheeling qualities. Sterlings speed up the material-transport job . . . make it possible to haul many additional loads each day. No wonder they are in such great demand for urgent war jobs all over the nation.

STERLING WHEELBARROW CO., MILWAUKEE, WIS.

Look for this Mark of STERLING Quality

Sterling WHEELBARROWS

A 4118-½

Reclamation Program To Produce More Food

(*Continued from preceding page*)

mended by the President before the bill is finally passed.

"The 29 projects in (a) and (b) above where construction has been retarded or deferred by the war are planned to provide irrigation service to 2,500,000 acres of new land to be brought under cultivation by irrigation for settlement purposes in the post-war period. In addition about 4,680,000 acres now irrigated but faced by water shortages will receive supplemental or substituted irrigation supplies. This total of 7,100,000 acres may be reduced by 1,500,000 acres if construction of irrigation facilities is permitted to resume as a means of increasing war food supplies. The 50 new projects mentioned in (c) above may increase the ultimate additional acreage which the projects can serve to more than 7,800,000 acres, if no additional area is provided with irrigation before the war closes. From the standpoint of area, the uncompleted and proposed projects range between 5,000 and 10,000 to 1,200,000 acres in size.

"In the projects under construction or authorized, the additional power facilities which can be installed, if post-war conditions require, will have a capacity of 2,300,000 kilowatts. Included in this total is the completion of installations at Boulder Dam and Grand Coulee Dam. In the proposed projects to be included in the shelf for a post-war program, the estimated power capacity is 1,000,000 kilowatts.

"On the basis of pre-war prices, the estimated cost of uncompleted work on projects under construction and of those authorized where construction has not started is $750,000,000. The shelf of 50 new projects for post-war construction may entail an outlay of approximately $250,000,000 at pre-war prices. This brings the total estimated expenditures of the Bureau's post-war program to about a billion dollars. Because of the instability of current prices as a guide, 1940 figures are used in estimating costs.

"Projects in the Bureau's program are located generally in rural areas from which western industrial centers have drawn labor. These areas also have provided large numbers of men for the armed services who will seek employment and settlement opportunities at the close of World War II.

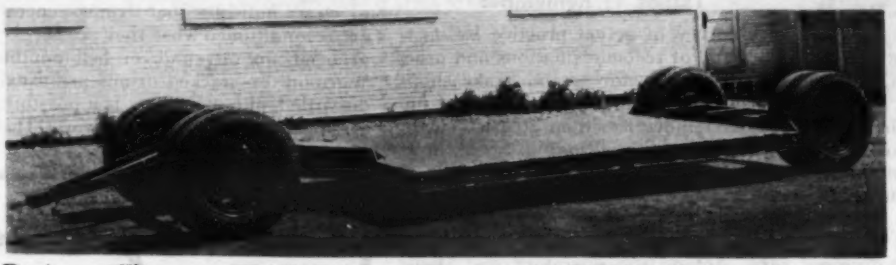
"On projects like Grand Coulee Dam, 40 per cent of the labor is employed at the site and 60 per cent in mines, forests, factories, transportation, and administration. On earth-fill dams, however, the distribution of employment would be reversed—perhaps 65 per cent at the site and 35 per cent in off-site employment.

"Studies of the Bureau of Labor Statistics indicate that 82 per cent of Reclamation construction expenditures are allocated for labor at the site and in off-site activities for the production of raw materials, fabrication, and transportation. On the basis of these studies a billion dollar post-war program, if crowded into one year, would provide employment for 427,000 workers.

"The major irrigation development which the Bureau can launch in its post-war construction program is the Columbia Basin Project in Washington State. Grand Coulee Dam, the source of storage water for the project, is completed. The irrigation facilities at pre-war prices are estimated to cost $229,000,000. This project with 1,200,000 acres of irrigable land will provide settlement opportunities on irrigated land for 25,000 to 30,000 farm families.

"Completion of all of the projects in the program will provide settlement opportunities for 50,000 to 60,000 farm families. From 20,000 to 25,000 additional farm families faced by droughts and unsuccessful dry-land farming in the Great Plains and other arid or semi-arid areas will be rehabilitated. Security will be given, through supplemental water projects, for 85,000 to 100,000 families in irrigated areas faced by recurring water shortages. Additional settlement opportunities also will be afforded, since adequate water supplies for irrigation would enable these established rural communities to support a larger population.

"More than 70 per cent of agricultural production in the West is dependent on irrigation, and over 80 per cent of the power comes from hydro developments. These percentages emphasize the importance of water conservation in the West in the post-war period and the need for increasing construction in these fields."



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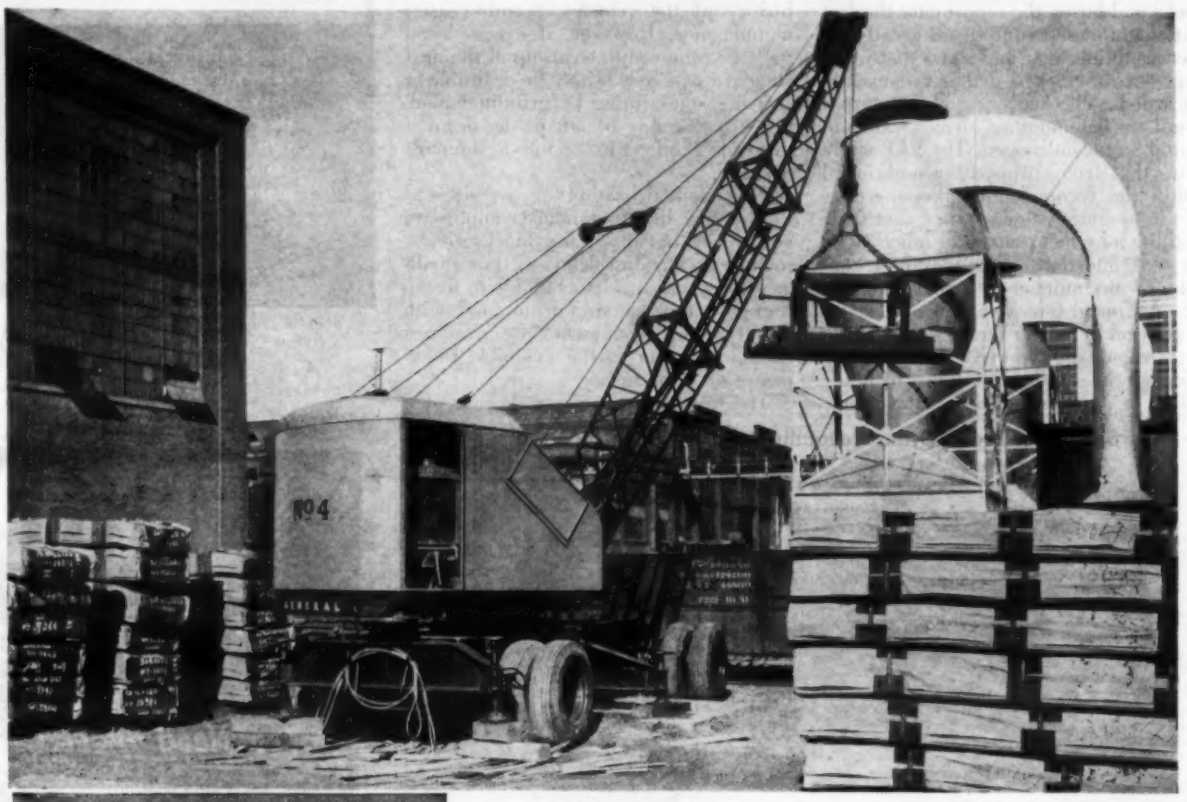
—4 models—
7, 10, 15 & 18½-ton capacities

Don't say, "We want a TRAILER." Say: "We want a MARTIN Trailer."—This will insure your getting a trailer that's EASY LOADING, POWERFUL, FAST, SAFE, LONG-WEARING and ECONOMICAL. . . . .

Sold by all Caterpillar Distributors. WRITE FOR BOOKLET

Martin Machine Company, Kewanee, Ill.



GENERAL

recommends the continued purchase of War Bonds and Stamps—and the observance of preventive maintenance to keep your machinery running.

GENERAL SUPERCRANE!

Why Super? Because it is Better! - - - Because it requires but one operator, and has but one engine - - - yet is mounted on rubber tires, steers hydraulically, moves without tracks or overhead connections - - - goes most anywhere. The SUPERCRANE handles more material faster, easier and for less cost.

GENERAL GIVES YOU MORE!

The OSGOOD COMPANY
Sizes: ½ to 2½ Cu. Yd.
Diesel - Oil - Gas - Electric
Associated with The GENERAL EXCAVATOR CO.

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HERCULES "IRONEROLLERS"
6 to 12 Tons
Diesel or Gasoline
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GENERAL

Sizes: ⅜-½-⅝-¾ Cu. Yd.
Diesel—Gas—Electric

SHOVELS
DRAGLINES - CRANES
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THE GENERAL EXCAVATOR COMPANY, Marion, Ohio

Many Truck Troubles From Worn Brake Drums

Reconditioning Found Practical and An Aid to Conservation of Materials: Summary of SAE Committee Report

+ TRUCK owners and operators experiencing trouble in truck wheels, faulty braking, excessive wear on tires, and too many lay-ups for brake relining will often find the cause in the poor condition of brake drums. In such cases, the hazard of uneven or locking brakes, the waste of rubber and loss of time can usually be cured by reconditioning the drums. A report on reconditioning brake drums, prepared by the Society of Automotive Engineers for the Office of Defense Transportation, points out how this reconditioning should be done.

Based on recommendations of manufacturers and brake shops and the practice of operators of both light and heavy trucks and buses, the report cites the fact that smoothness of the drum greatly influences lining wear and states that while worn-out or cracked drums are usually discarded, checked, grooved, out-of-round or bell-mouthed drums can and should be reconditioned. The SAE study shows that drums properly reconditioned within the recommended limits are as safe in operation as new ones, that their total life may be extended as much as 80 per cent, and that drums may be reconditioned any number of times as long as the total metal removed does not exceed 25 per cent of new-drum thickness. Drum metal should be removed in thicknesses to match the standard oversizes of brake lining as recommended by the Brake Lining Manufacturers Association.

The Office of Defense Transportation points out that, although reconditioning of drums has not been a common practice in the past, the necessity of conserving tires and the current shortage of parts and labor make it an important means of preserving existing equipment.

Things to Remember

A survey of actual practice by operators and of recommendations and practice by manufacturers and brake shops indicates that the greater number of operators remove less than 20 per cent of the metal in reconditioning. Some, however, remove as much as 40 per cent and a plurality of manufacturers and brake shop operators favor the removal of metal in excess of 25 per cent, if necessary. Among the operators and shops who have gone beyond the recommendations of the SAE Committee, there has been no indication of undesirable results.

Standardization of brake-drum cuts to match standard oversize lining thicknesses permits the reduction of labor costs and, when accompanied by a card history of the vehicles, permits easier maintenance. However, if excess metal must be removed to clean up at the next standard oversize, it may be desirable to sacrifice some lining by grinding. Shallow grooves may be left in the drum if the drum is otherwise smooth at standard oversize.

This standardization of oversizes to fit oversize lining standards applies to equipment having brake blocks of ½ inch or greater in thickness. For smaller sizes, shim stock is available to fit the lining to the oversize drum, and with this type of equipment, the oversizes should conform to the available thicknesses of shim stock.

The Committee suggests the use of a dial gage and scribe at the time of inspection or reduction of brake performance, as a means of determining a standard depth of irregularity requiring reconditioning.

The accompanying table, showing the number of fleet operators and manufacturers recommending reconditioning of brake drums under varying conditions of wear, indicates that drums generally are reconditioned when they are checked, grooved, out-of-round, or bell-mouthed. Worn-out or cracked drums are usually discarded, although there is a possibility of salvage by metallizing them. There have been some cases of cracked drums being welded successfully. Also, it is possible to shrink an external band around a cracked drum. However, the Committee does not have sufficient data on the operation of these drums to make any recommendations at this time.

Survey of Brake Drum Reconditioning by Fleet Operators

	Surface Checks	Deep Checks	Grooves	Out-of-Round	Bell-Mouthed	Worn	Small Cracks	Large Cracks
RECONDITION DRUMS								
Light	3	4	7	4	1	4		
Heavy	3	3	7	5	5	3	3	2
Manufacturers	4	6	6	6	5	3	1	1
KEEP IN OPERATION WITHOUT RECONDITIONING								
Light	2		1					
Heavy	4							
Manufacturers	2							
DISCARD DRUMS								
Light		1		2	5	2	7	7
Heavy		2		2	1	7	8	10
Manufacturers						3	6	6
HAVE HAD LITTLE OR NO EXPERIENCE WITH CONDITION								
Light	2	2		1	1	1		
Heavy		1	1	1	1			
Manufacturers					1			

For the sake of brevity, the fleets have been divided into two categories, those operating heavy equipment and those operating light. Bus operations have been included in the heavy operations. Brake shops have been included with manufacturers.

Job accidents have killed more of our productive workers than have the Nazis and the Japanese. Most of these accidents could have been avoided. See that safety devices and practices prevent accidents on your job.

So Useful, It's More Than a Jack!

Simplex No. 310-A, 15-tons capacity; 22" high; 13" lift. Toe lifts from minimum of 2¼". Weight 74 lbs.

The Simplex 310-A Emergency Jack, with its accessories—5' grab hook chain and adjustable cap shoe — does jobs the easy way. Lifts from below floor level (using chain), tilts on its base for angle jacking, razing walls, etc.; pushes horizontally.

Templeton, Kenly & Co.
Chicago, Illinois
Better, Safer Construction Jacks Since 1899

Makes Your Jacks Last Longer!
Give them proper lubrication and care. Free bulletin tells how.

Simplex LEVER · SCREW · HYDRAULIC Jacks

DRILLMASTER
COMPRESSOR & TOOLS UNIT
Air Power and Air Tools—
When and Where You Need Them...

"HERE'S A PACKAGE"—designed for the many jobs required in construction and maintenance that call for a portable compressor and the tools to put this power to work . . . No matter how distant or how inaccessible your location is —one order, one shipment, brings you this compact, ready-to-work power plant and tools.

They're All in This Complete Unit

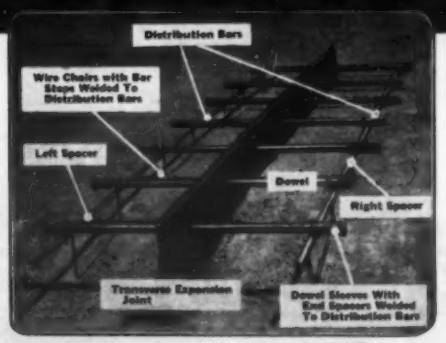
A Model 105 SCHRAMM Compressor with special racks and tool boxes with fixed locations for each tool and accessory, so that most any compressor requirement that arises can be met and handled. Equipment includes: Double hose reels, live air type, each equipped with three 50-ft. lengths of ¾" air hose. Air receiver with three extra outlets, equipped with quick action valves, hose couplings and 3½" vise for flat or pipe work, on swivel base. Tools recommended depend entirely on user's requirements and the ability of tool manufacturer to furnish them under existing conditions.

Write Today for Bulletin C-9

SCHRAMM INC.
THE COMPRESSOR PEOPLE
WEST CHESTER, PA.

Build Better Runways for the BIRDS OF WAR!

LACLEDE


Distribution Bars
Wire Chairs with Bar Steps Welded To Distribution Bars
Left Spacer
Dowel
Right Spacer
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LACLEDE WELDED DOWEL SPACERS

Time-Saving — Accurate — Rigid — Available Now!

LACLEDE STEEL COMPANY
SAINT LOUIS, MISSOURI

Why Post-War Plans Should Be Made Now

The Post-War Highway Conference of the American Road Builders' Association brought out many reasons why post-war planning must be started immediately. In his well-received discussion of post-war needs, General Philip B. Fleming, Administrator, Federal Works Agency, made six pertinent points:

1. Idleness is extremely costly; it cost us $200,000,000,000 during the depression.
2. The Federal Government has the obligation to close the job gap that private industry cannot fill.
3. The most useful jobs are in the public works field.
4. It requires months of preparation to produce plans. Therefore, post-war planning must be started now to insure the readiness of projects for letting and employment as soon as men need jobs after the war.
5. Improvised relief will sustain life, but it adds no wealth to the nation.
6. Skill deteriorates with disuse. Hence, jobs must be provided for skilled workers promptly.
7. No one wants doles; they are enervating, undermine self-confidence, and no one prefers them to a useful job at decent wages.

Alvin H. Hanson, Economic Advisor to the Board of Governors of the Federal Reserve Board of Chicago, spoke on post-war planning from the business standpoint. He asked the question, "What will there be to buy in consumer goods the day after war ends?" Consumer goods stocks will be depleted, and it will take time to start the manufacture of the needed products. It took Henry Ford eighteen months to retool when he stopped making the Model T before he could start the Model A rolling off the production line. During the period of retooling, the savings of workers and soldiers will be spent. There will be approximately 6,000,000 workers discharged by manufacturing industries which have been engaged in war production, and about 1,000,000 of these can be absorbed immediately in the clothing, paper, and textile industries. This leaves a net discharge of 5,000,000 workers. There will be approximately 7,500,000 soldiers demobilized over a period at the end of the war, leaving about 3,500,000 in service. Approximately 400,000 will be discharged from transportation services, and it is expected that the Government will release about 2,000,000 workers.

This means that there will be 15,000,000 employables to be absorbed. Of this, approximately 5,000,000 women among the older and younger groups will drop out of the labor market, and there will be the usual 2,000,000 persons permanently unemployed, leaving a net of 8,000,000 to be absorbed. These will be taken up as follows: 2,000,000 by agriculture, 1,000,000 in services and financing, 1,000,000 as servants or self-employed, and 2,000,000 absorbed by trade. This leaves approximately 2,000,000 employables to be absorbed by construction.

As an example of the problem ahead, it must be recalled that the Army and Navy and business in the period of 1940-43, in three years, absorbed 16,000,000 employees. Private industry never absorbed more than 3,000,000 per year at its peak.

The sum of $6,000,000,000 will employ 1,000,000 people on the site of construction. So, if construction employment is to rise to 2,500,000 people, the cost for public and private construction will be $15,000,000,000 a year, as compared to $7,000,000,000 expended on construction in 1939, when 1,200,000 were employed on the site of construction projects.

A delay of eighteen months in putting a million men to work at the beginning of the depression brought CWA and its hereditary relief agencies into being. Construction must be prepared to expand more than ever before in order to prevent the return to life of Federal relief agencies and to insure the continuance of the democratic economical contract system.

Never have proper lubrication and care of equipment been so important. We suggest you follow our series of articles on equipment care, to keep your machines working for Victory.

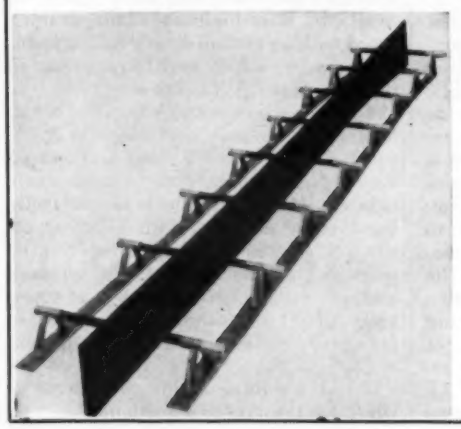
Peacetime Products In War and Post-War

A pocket-size 48-page booklet has been issued by Gar Wood Industries, Inc., Detroit, Mich., describing the peacetime products of each of its six pre-war divisions, their war work, and the added wartime division. These now include the Hoist & Body Division, Winch & Crane Division, Tank Division, Heating Division, Boat Division, and the new Gun Carriage Division.

Copies of this illustrated booklet may be secured direct from the company.

For ease of assembly and speed of installation of expansion and contraction joints,

use TRUS-ASSEMBLY



It brings extra profits to the *contractor* by reducing installation costs to a minimum;

also saves the *government* money by eliminating maintenance expense caused by inaccurate alignment of dowels.

Write for circular

HIGHWAY STEEL PRODUCTS CO.
Chicago Heights, Illinois

DEPENDABLE

DEPENDABILITY SEAL OF Service Proved QUALITY PERFORMANCE

This seal is found ONLY on Blackhawk Jacks — your assurance of a wise and safe investment.

IT'S the more-for-your-money value built right into Blackhawk Hydraulic Jacks that makes them so downright dependable. They're rugged, tough, powerful; handle all jobs as they come — fast, smoothly, safely. That's why you need dependable Blackhawk Hydraulic Jacks to lick many tough wartime emergency problems of lifting, lowering, pushing, bending, testing, as well as everyday construction and maintenance jobs. Every construction engineer, foreman and maintenance man should know about MODERN Blackhawk Hydraulic Jacks, available in capacities of 3, 5, 8, 12, 20, 30 and 50 tons. Write for new Bulletin V-43 — or see your Blackhawk Distributor.

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Please rush Blackhawk Hydraulic Equipment Bulletin V-43.

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WORLD'S LARGEST MANUFACTURER OF HYDRAULIC JACKS

HERE'S THE PAY-OFF

It's the BUCKET that digs the dirt! And operators will tell you that A PAGE AUTOMATIC DRAGLINE BUCKET WILL OUTDIG ANY OTHER BUCKET OF EQUAL SIZE AND WEIGHT.

Why? Because the PAGE bucket is so shaped and designed that it AUTOMATICALLY lands in digging position every time. ALL its weight is ON THE TEETH causing it to DIG-RIGHT-IN AT ANY DEPTH!

Result: A PAGE AUTOMATIC DRAGLINE BUCKET eliminates waste motion . . . boosts production . . . saves man hours!

PAGE ENGINEERING COMPANY • Chicago, Illinois

★ ★ ★ ★ ★

PAGE *Automatic* DRAGLINE BUCKETS

★ BOOST PRODUCTION

KEEP AMERICA STRONG ★

Contractors Can Aid In Road Maintenance

(*Continued from page 7*)

cal, charged with the responsibility of highway and street maintenance have carried on this work in a large measure with labor hired directly and with publicly owned equipment. Now they are hard pressed to get the labor, and the purchase of needed new equipment is impossible. While much of the repair material required has been available, there are critical exceptions, notably the curtailment in the use of bituminous materials.

These are the conditions to be faced for the duration. We must prepare for a program of extraordinary maintenance. This will mean, in some cases, the adoption of what may seem to be extraordinary methods.

Why Not Call on Contractors?

There is no argument among our ablest administrative officials on the economy of using the contract method rather than the direct-labor method on public construction. It has been the rule to do practically all highway and street construction by contract. However, there is no such uniformity of practice on maintenance, resurfacing, and reconstruction.

As a matter of fact, it is difficult to draw a sharp line between construction, reconstruction and maintenance. The *name* by which an operation is known has no bearing on the question of using the *contract* method. An expression of policy in this regard comes from the report of a state highway department: "All operations whose cost can be estimated in advance, making possible the use of open competitive bids, should be done by the contract system".

Let us consider some of the objections which might be raised to the contract method for maintenance. The first is concerned with the availability of contractors. It could be pointed out that during the past year, state highway departments have been begging contractors to bid on certain construction projects, and no bids were forthcoming. Therefore, one might ask how one could expect bids on the much less attractive type of maintenance project. However, during the past year, contractors were completely occupied on the extensive war construction program which presented not only an urgent need for completion but also sufficiently high priorities on materials and labor to insure the completion of the work. Many contractors felt that the comparatively low preference rating given many highway projects made it useless to bid on them. In many cases, contractors are still unable to finish road construction projects awarded to them as far back as 1941, and there have been many recent stop orders by WPB on contract projects under way to which WPB earlier granted a priority.

However, conditions in the construction field are changing rapidly. The peak of the war construction program was reached in August, 1942, and it has tapered off very rapidly. It is quite certain that more and more contractors will be looking for jobs that will not be available in highway construction. Although contractors' organizations are being depleted by selective service and other causes, and they are forced to make their present plants and equipment last, they will have some men and some equipment available. Wise highway administrators, faced with an extraordinary maintenance program, would do well to make use of these contractors' facilities.

On only a very minor volume of maintenance and repair operations is it impracticable to prepare plans and specifications. There is no type of reconstruction or resurfacing which is not being handled by contract, with excellent results. Plans and specifications can be prepared, and even in the case of small additions and betterments, such as guard rail, culvert extensions, etc., these are being successfully performed by contract.

There are three major advantages of work by the contract method. It guarantees good work, because a responsible contractor takes pride in his work and he knows he will be penalized if the work is unsatisfactory; it means that the job will be finished sooner, because the contractor is bound by the terms of the contract to complete the work in a specified time. In addition to that, the contractor is free of the red tape which frequently binds the public official in securing materials and meeting emergencies. Thirdly, contract work is more economical. The Bureau of Public Roads conducted a nation-wide experiment at one time, and the result showed a 20 per cent saving under the contract system as compared to direct labor costs.

Contracting highway maintenance is advocated on the basis of public interest only, especially at this critical time when such an extraordinary program must be undertaken. It is suggested that letting highway maintenance by contract will bring credit to those who use it. Not only will they make shrinking highway revenues go farther, but they will, at the same time, be relieving themselves of many of the burdens incident to pushing work in the field.

In the present crisis, the development of a group of competent contractors to handle extraordinary maintenance can contribute greatly to keeping our highways in condition to carry the necessary war traffic without interruption.

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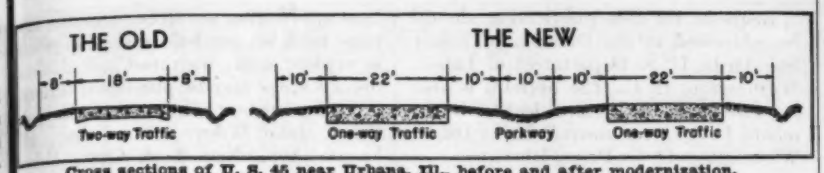

Cross sections of U. S. 45 near Urbana, Ill., before and after modernization.

Building Safer Roads For Illinois Motorists

Each year a certain amount of the total highway revenue in Illinois is available for new construction work. It is only natural that the particular job affecting any group of taxpayers should seem the most important to that group. It is therefore necessary for State officials to determine through engineering studies which project should be given precedence.

With the tremendous expansion of Chanute Field in the war program, the 16-mile section of U. S. Route 45 between Rantoul and Urbana was subjected to a volume of traffic that it could not adequately or safely handle. During 1941, traffic congestion was so acute on this section that the accident rate was entirely out of proportion, and it was often referred to as "death highway". For that one-year period on this 16-mile section of highway, motor-vehicle accidents caused 7 deaths, 157 injuries, and an unestimated total in property damage.

Not only because this section of highway serves a very vital area in the war effort but also the severity of accident occurrence placed it high on the list of highways scheduled for modernization. Work was started early in 1942 and is now nearing completion. The old road had a concrete surface 18 feet in width, several narrow bridges, narrow shoulders which were difficult to keep in repair because traffic volumes so overtaxed the road that the shoulders were used excessively by vehicles, and the surface rough in many places because of breakage. With the exception of a short section just north of Urbana, the new highway is divided by either a 4-foot flush median strip or a parkway 40 feet in width. Two lanes are provided for traffic in each direction so as to eliminate head-on crashes that were so common on the old narrow road. Individual traffic lanes are 2 feet wider than on the old road even though opposing traffic is eliminated. The surface is considerably thicker than on the old road and breakage should therefore be reduced. Shoulders have been widened, alignment has been improved, and narrow bridges have been eliminated.

The total cost of the highway upon completion will be approximately $1,000,000 and should serve this area adequately for many years to come. Safe modern highways are expensive—accidents and delay are more expensive, states the *Safety Bulletin* of the Illinois Division of Highways.

Cross Breaker Cords For Conveyor Belts

The Transcord Breaker construction for conveyor belting in which the breaker cords are placed across the belt width, rather than parallel with the cords of the belt itself, has recently been granted a patent, according to the B. F. Goodrich Co., Akron, Ohio. This construction provides greater resistance to cutting action from materials striking the belt.

The Transcord Breaker also provides much greater adhesion between the cover and carcass, according to Goodrich. Tests of both types on conveyors in heavy-duty service have checked this assertion. Two other advantages of the patented construction are that it tends to stop most cuts and gouges before they penetrate to the belt carcass. The Transcord Breaker is placed a short distance above the top ply, leaving a protective layer of rubber between the breaker and the carcass. This construction prevents distortion of the rubber cover beyond its elastic limit because of severe impact. Rubber is susceptible to cutting or gouging under extreme tension.

Users of conveyor belts for handling heavy materials such as crushed stone and gravel may secure further information regarding the life and cost of belts of this type from the manufacturer.

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One contractor said, "With the Johnson Float Finisher it takes one man to run the machine and one man for the wire brooming, so we get along with four less men. However, the labor-saving angle is a small item in comparison with the speedier progress and smooth job done by the finisher." Authentic data from past performances, however, proves conclusively that these savings in labor alone will pay for a Johnson Float Finisher in less than 25 miles of highway finishing.

The records shown above tell the story—faster finishing...higher production...smoother highways...and a saving in labor costs enough to pay for your Johnson Float Finisher.

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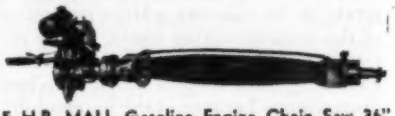

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New Curing Compound For Concrete Projects

The first essential requirement in a concrete curing material is its ability to retain in the concrete a large percentage of the original mixing water. Many materials and methods of concrete curing have been used, some of which have been discontinued because of the impossibility of securing the material at present or because more efficient methods have been developed.

In the past few years, and particularly in the war construction program, the membrane-type curing compound has come to the fore. One of the newer of these membrane-type curing compounds is Marvel-Kote, which has been on the market for about two years, during which time it has been used on government projects throughout the country. Marvel-Kote, although a comparatively new product, is the result of research work by chemists and waterproofing engineers with more than 17 years' experience in the concreting and waterproofing field.

Marvel-Kote concrete curing compound is a combination of synthetic resins, hydro-carbons, natural resins and amalgamating agents which are carefully blended and processed. It contains absolutely no wax and is in no way injurious to the surface or body of the concrete to which it is applied. Its application is easy, being sprayed on the concrete either by hand or power spraying equipment, and it leaves no discoloration on the surface. It contains a red coloring material to aid in uniformity of application, but this color disappears a few days after the material has been applied. Marvel-Kote is also available without any coloring material, if desired.

Marvel-Kote is made in various solid contents, depending upon the requirements of the engineers and the project. That most commonly used now is Marvel-Kote concrete curing compound No. 40, and laboratory checks on this material show that it has a moisture retention of more than 94 per cent over a 7-day period when tested according to approved method, the producer states.

Complete information on Marvel-Kote curing compound, as well as on the company's complete line of waterproofing specialities, may be secured by those interested direct from the Concrete Chemical Co., Railway Exchange Bldg., Kansas City, Mo., by referring to this item.

Weight-Lifting Injuries

Special Bulletin No. 11 recently issued by the United States Department of Labor under the title, "A Guide to the Prevention of Weight-Lifting Injuries," discusses the many minor, as well as major, injuries in material handling, which has long been the foremost source of work injuries in manufacturing as well as in construction. Strains, sprains and hernias incurred in manual lifting and carrying loom large among such injuries, both in number and in seriousness. Laying workers up for seven to nineteen weeks, these injuries create a serious productive-time loss which can be eliminated by proper handling practices and methods. Such methods and practices are discussed and illustrated in this bulletin.

Requests for this publication should be addressed to the Division of Labor Standards, U. S. Department of Labor, Washington, D. C. The bulletin is also for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. Price, 10 cents.

Geodetic Control Surveys

The first edition of "Geodetic Control Surveys" was issued in 1940 in lithoprint form for student instruction. Its value and service, and the increasing number of states which have legalized the plane coordinate systems of control, have led to the amplification of the original material in book form in this second edition. The author is H. Oakley Sharp, Professor of Geodesy and Transportation Engineering at Rensselaer Polytechnic Institute, who has already prepared a basic study on the principles of terrestrial and aerial photographic surveying.

Both fundamental theory and practical application are stressed in this 129-page book on geodetic surveying which is replete with diagrams and illustrations. Copies may be purchased through this magazine or direct from the publisher, John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price: $3.50.

Photo Courtesy U. S. Bureau of Reclamation

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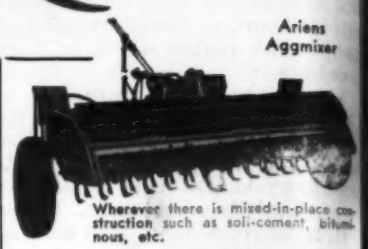
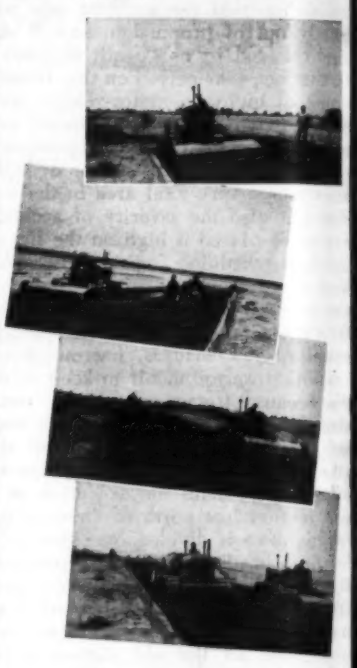


Wherever there is mixed-in-place construction such as soil-cement, bituminous, etc.



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Officers, Directors, Board of Governors and Special Committee Chairmen of the Associated Equipment Distributors at their meeting in Chicago June 8.

What Army Engineers Accomplish in Action

Speaking before a group of over 1,500 representatives of the leading construction trade associations at the Hotel Commodore in New York City on June 3, Major General Eugene Reybold, Chief of Engineers, said, "You can't beat a man at his own game." That is the reason why the Corps of Engineers is now enlisting men of experience in the operation of construction equipment because they already know the rules and strategy of construction.

Major General Reybold reported, "The record of the Engineers in North Africa and elsewhere should be a challenge to these men. Air-borne engineers, with light equipment developed specifically for such work, flew nearly a thousand miles to forward airdrome sites. They had one field operating for Flying Fortresses in three days and another field for fighter planes in four days. Transport planes flew all equipment, including steel-plank landing mats and a fair amount of bitumen for stabilizing soil, to the site, using a natural grass strip for landing the transports.

"Engineers have participated in landing operations, rushed through satisfactory water supplies under difficulties, operated port facilities, sped the construction of pipe lines to insure adequate supplies of high-octane gasoline for the forward airfields, repaired and built highways—and handled other normal construction projects."

Men who have had any experience whatsoever in the construction field and who are between 18 and 38 years may volunteer for induction. Go to any U. S. Army recruiting station or to any office of the U. S. Army Corps of Engineers and explain your trade qualification. If it is satisfactory, you will be sent to your local Selective Service Board with a letter, where you volunteer for induction. When you are accepted for voluntary induction, you will be sent to the Armed Forces Induction Station for physical examination for general fitness. Upon induction you will be sent to an Engineer Training Center for basic training, and then you will be assigned duties to fit your skill.

If you are between 38 and 50 years old, you may volunteer for enlistment at any U. S. Army Recruiting Station or any office of the U. S. Army Corps of Engineers. Explain your trade qualification and if it is satisfactory and you are physically qualified for general service or special assignment, you will be enlisted in the Army of the United States and sent to an Engineer Training Center for basic training. Then you will be assigned duties to fit your skill.

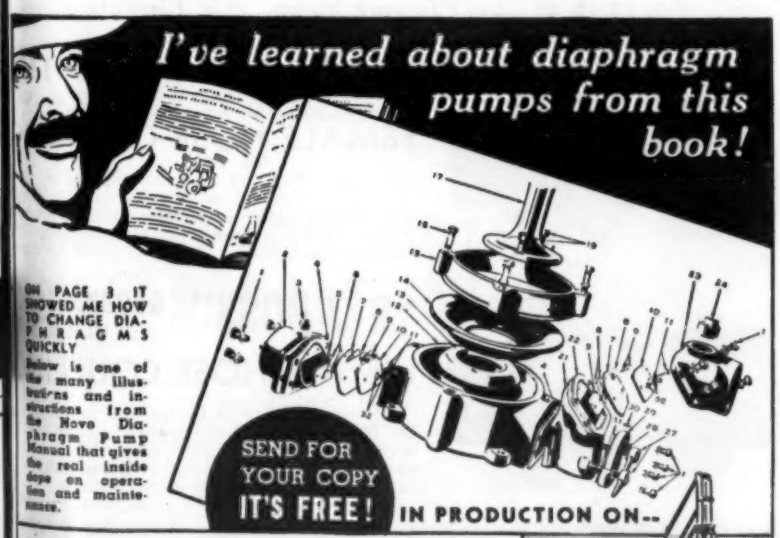
Eligible men may also volunteer for similar service with the Navy Seabees at any Navy Recruiting Station. Service with the Army Engineers or the Navy Seabees is entirely for overseas operations.

New List of Standards

The American Standards Association recently announced the publication of its new List of American Standards which will serve as a useful reference for the engineering and purchasing departments of manufacturing firms. More than 600 standards are listed, 94 of which represent new and revised standards approved since August, 1942.

Standards are listed by subject and cover civil, mechanical, and other engineering fields as well as metals and materials, methods of testing for finished products, dimensions, etc. They reach into every important engineering field and serve as a basis for many Federal, state, county, and municipal regulations.

This List of Standards, which contains the prices of copies of all the standards it covers, may be secured gratis direct from the American Standards Association, 29 West 39th St., New York City.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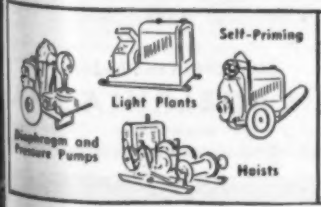

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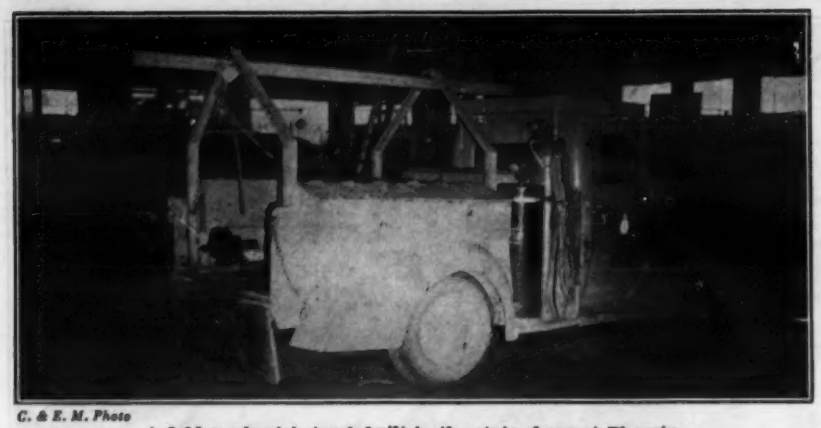

C. & E. M. Photo

A field mechanic's truck built in the state shops at Phoenix.

Highway Shops Keep Equipment in Trim

(*Continued from page 42*)

er parts and supplies. These units have complete acetylene welding outfits, including special-built carriers for the oxygen and acetylene cylinders.

A complete outfit for the rewinding of rotary brooms was made so that various sizes could be rebuilt quickly. This has come in very handy in servicing the brooms at two of the nearby airports where they wore out the brooms rapidly.

An air-raid siren was built in the shops to serve the city until a commercial-type siren could be purchased. This siren is probably unique in that it is made of a GMC brake drum and is powered by a 5-hp electric motor. It may be heard over the entire community.

In the sign shop is a round assembly stand with small radial bins for the various sizes of reflector buttons and the necessary screws and nuts which has made the assembly of these signs a matter of minutes instead of hours. Two men can work at the table at one time and the bins rotated to reach the required part without delay.

The Main Shops

The Main Shops at Phoenix, measuring 175 x 205 feet, have a center bay 50 x 175 feet in which there is a 20-ton crane, running the full depth of the shops, which is capable of handling any piece of highway equipment that the state equipment trailers can haul over the road to the shop. There are four rolling steel doors 12 x 14 feet electrically operated to provide ample space for the movement of machines in and out of the shop.

At the right back corner of the building is the machine shop completely equipped even to cut new gears if necessary. In the center at the back is the tractor shop where large and small tractors are completely overhauled and sent back to work "as good as new". Toward the left at the back is the upholstering shop, a new feature in any of the state or county shops we have visited. There old seats for tractors, power graders, automobiles and other equipment are completely overhauled and given a new lease on life and greater comfort to the operator. In the left back corner is the carpenter shop replete with its power saws, tools and other devices to produce any type of woodwork needed anywhere in the state, such as signs, frames for truck bodies, and even desks and tables.

Just in front of the carpenter shop is the tire shop where everything is done to keep the dwindling stock of tires for equipment and vehicles in condition for the duration. Inner tubes are nursed along as much as possible, within the limits of safety, before being turned in as scrap rubber. Adjacent to the tire shop is a space set aside for the storage of steel, including tool, drill and various grades of softer steels required in the operation of a shop of this size.

At the right center of the shop is the heavy-duty truck shop where the big all-wheel-drive trucks and the bigger two-wheel-drive trucks are put through their overhauls. Adjacent is the area set aside for rebuilding gas and diesel engines taken from tractors and power equipment. This shop is very well equipped and, with the machine shop nearby, is ready to make an engine give out full power long after it would have been turned in toward a new piece of equipment, a few months ago.

The right-hand side of the shop toward the front contains the wash room and the tool and parts room. In this latter all-important treasure house all small tools and drills are stored and issued only on the check system. Parts and materials are issued on requisition charging the item to the equipment on which it is used. Just outside of the parts room is the light-car repair shop where passenger cars, pick-ups and other light automotive units are overhauled out of the way of the heavy-duty equipment.

Swinging over to the front of the shop at the left we find the electric and acetylene welding shop, the blacksmith shop next door, and in the front corner of the building, the body repair shop where a wide variety of work is handled, including metal working and radiator repairs.

All of these separate shops, each with its group of men working on specialized operations, has sufficient room for its work without crowding the next department, and the light is uniform over the entire floor due to the well-designed sawtooth roof.

Adjacent Service Shops

Not all of the servicing of equipment is done within the large shops for there are outside shops for certain of the operations. We have mentioned the sign shop which is located next to the main shop, then there is an outside steam rack with a Kerrick Kleaner for removing grease, grime and paint when a machine is to be overhauled. Beyond the steam rack is the paint shop with a heavy-duty fan to remove the excess spray and keep the atmosphere clear. Next is the grease rack with an Alemite pneumatic lubrication outfit.

Operation and Car Pool

At the main door of the shops the Shop Foreman has a high desk, and no piece of equipment or car is admitted to the shop for any work without his issuing a work order for the necessary overhaul or adjustment. Even before a car or machine can get to the shop, it must pass a "toll gate" operated at the entrance to the yard, preventing the entry or leaving of any machine without the gate keeper making a record of the passing, with the time and the name of the driver. This gate is located adjacent to the Equipment Superintendent's office.

In the interest of conservation, a word so greatly used in our language and so greatly needed today, a car pool is maintained for the use of men requiring transportation to various field work. The heads of departments still have cars assigned to them but the minor operatives make use of a small group of cars which are sent out as required. This has made possible the release of about half the cars usually used in the highway department and the use of the tires on other cars as needed.

Personnel

The Equipment Division of the Arizona Highway Department was established to furnish all major equipment necessary for the construction and maintenance of the state highway system. The shops are a major part of this activity and are under the direction of the State Highway Engineer and in direct charge of the Superintendent of Equipment.

Post-war highway plans can fail if the right-of-way is not secured now.—Carl W. Brown, President, American Road Builders' Ass.

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AMERICAN WHEELBARROWS

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With Steel Wheel for WAR ORDERS

Barrow shown is the American No. 1—4 cu. ft. struck capacity DeLuxe Concrete Wheelbarrow available with steel wheel.

Code with steel wheel.....PERFECT-S

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Like all DIXON products, the couplings described above are designed and manufactured to standards established after many years of experience in meeting industry's progressive requirements. They have that *engineered quality* that guarantees long, low-cost service.

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President Proposes Public Works Program

In a recent communication addressed to Vice President Wallace, President Roosevelt called upon Congress for the prompt enactment of legislation to assist the states, counties and cities in the preparation of plans for post-war public works, pointing out that if the reservoir of public works projects being stored up during the war is to provide employment opportunities and demands for materials when the war is over, the plans and specifications must be prepared during the war.

To carry out his proposal, the President submitted to Congress a draft of a bill providing Federal Aid funds for advance planning. The bill, which has been introduced in both the House and the Senate, calls for the immediate appropriation of not less than $10,000,000 to be advanced to the states and their political subdivisions for the purpose of encouraging and giving financial aid and assistance in establishing comprehensive plans and programs for the post-war development of public works. Such funds are to be appropriated annually, and apportioned among the states according to area and population, one half of such funds to be apportioned among the states in the proportion that the area of the state bears to the total area of all states, and the other half in the proportion that the population of each state bears to the total population of all the states.

As a prerequisite to the eligibility of states obtaining such funds, the proposed law requires: (1) the establishment by law of a state planning agency; (2) enactment of legislation enabling counties, cities and other state agencies to participate; (3) adoption of appropriate measures assuring that political subdivisions of the states shall share in the distribution of planning funds in some reasonably proportionate fashion. Funds would be made available only upon certification of the National Resources Planning Board and in the event that a state fails to use funds apportioned to it during any fiscal year, such funds revert to the Treasury.

Another section of the bill authorizes the appropriation of $75,000,000 for advances to states and their political subdivisions for making surveys, investigations, architectural and engineering plans and specifications for specific public works to facilitate and expedite the selection and inauguration of such construction in the post-war period. Such advances are to be repaid to the United States if and when funds become available by Federal grant or loan to the agency involved for the undertaking of the public works projects set up under the terms of the bill.

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Save to share the peace.
Buy War Bonds.

States' Highway Debts

State highway obligations for 38 states having outstanding road debts on January 1, 1943, total $2,433,901,213, according to the Public Roads Administration.

Arizona, Indiana, Nebraska, Nevada, Oklahoma, South Dakota and Utah were reported free of debt, while information on the indebtedness in Florida, Ohio and Texas was not available for the report.

THIS OUTFIT WILL BE HONEY FOR YOU

The "Seabees" are the Contractors of the Navy . . they need men who know the construction game. It's your chance to serve and keep right on with the same kind of work which you are doing. The job of the "Seabees", the Navy's Construction Battalions, is to construct, as rapidly as possible, docks, bridges, airfields and roads . . operational bases close to the scene of action. Help to bring closer the day of final Victory . . . join the "Seabees". It's your outfit . . . you'll like the assignment.

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helped maintain the fast pace set for all operations. The massive constructions which GOODALL was able to supply were essential to the round-the-clock service demanded. Few products are ever called upon to meet more severe tests than those used on this vital Victory project.

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For Your Post-War File

Because of the large amount of material being published on post-war planning and the difficulty of keeping abreast of the latest plans, we shall, from time to time, publish lists of reports, pamphlets, and books which are available and which we believe our readers would like to have in their post-war files. The first of these lists follows:

1. "American Air Transport", 29 pages, 6 x 9¼ inches: a report by the Office of War Information on all phases of American air transport at the present time, and the future of air transport; released June 7, 1943; U. S. Government Printing Office, Washington, D. C.

2. "Post-War Planning in the United States—An Organization Directory—2", 101 pages, 6⅛ x 9¼ inches: the second in a series of directories of the various agencies in the United States working on post-war problems; published May, 1943, by the Twentieth Century Fund, 330 W. 42nd St., New York City. Price, $1.00.

3. "Markets After the War, an Approach to Their Analysis", 43 pages, 8 x 10½ inches; a study to enable marketing analysts to set their sights on the post-war opportunities of American business; published March, 1943, and released May, 1943, by the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

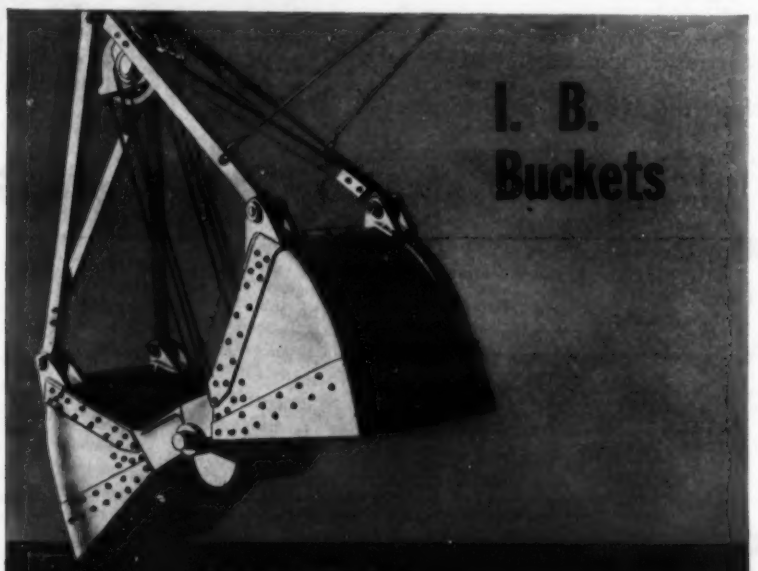
4. "National Resources Development Report for 1943" containing two reports of the National Resources Planning Board: Part I, Post-War Plan and Program; Part II, Wartime Planning for War and Post-War; Part III, Security, Work and Relief Policies: 9 x 11⅜ inches, Document No. 128, Part 2, 78th Congress, 1st Session, referred to the Committee of the whole House on the state of the Union, March 10, 1943, printed and released, May, 1943.

5. "The Airplane and Tomorrow's World", 31 pages, 5⅜ x 8½ inches; an illustrated discussion of domestic and international aviation and the freedom of the air; a Public Affairs Pamphlet, published May, 1943, by Public Affairs Committee, Inc., 30 Rockefeller Plaza, New York City. Price, 10 cents.

New LeTourneau Bulletin

The latest in the LeTourneau series of service brochures has just been released by R. G. LeTourneau, Inc., Peoria, Ill. This 8-page colored booklet "Lower Earth-Moving Costs in War and Peace" discusses complete shop service, rapid repair aid, dealer help in job planning, use of factory instruction books, service charts and other pamphlets on operation, tire and parts conservation, training of "green" operators, and other pertinent subjects.

Copies of this Earth-Moving Specialist Folder Form No. A-36 may be secured direct from R. G. LeTourneau or from any LeTourneau-Caterpillar dealer.



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Directory of EQUIPMENT DISTRIBUTORS

The following cards (arranged by states) show the names of dealers in contractors' equipment and supplies, with a record of various lines handled.

GARLINGHOUSE BROS.
2416 E. 16th St. Los Angeles, Calif.
Southern California Distributors for
BROWNING—Truck Cranes, Shovels, Locomotive Cranes
DEMPSTER—Dumpsters
DIAMOND IRON WORKS—Crushers, Portable Gravel Plants
DAVEY—Compressors
LAMBERT-NATIONAL—Hoists and Cableways
McKIERNAN-TERRY CORP.—Pile Hammers
A. LESCHEN & SONS—Wire Rope
NOVO—Engines, Pumps, etc.
OMAHA—Dragline Buckets
OWEN—Clamshell Buckets
RANSOME—Concrete Mixers, Pavers, etc.
UNIVERSAL—Panel Forms, Form Clamps, etc.
Manufacturers of
GAR-BRO—Concrete Carts, Wheelbarrows, Concrete Hoppers, Buckets, etc.
Member: Associated Equipment Distributors

EDWARD R. BACON CO.
Folsom at 17th St.
San Francisco, Calif.
Asroil Emulsion Distrs.
American Concrete Grinders
"Berg" Concrete Surfacers
Byers Shovels, Cranes
Cleveland Trenchers
Dobbie Derricks, Fittings
Erie Rollers
Gar-Bro Barrows, Carts
Hercules Power Units
Hough Sweepers
Huber Rollers
Interstate Tramways
Jaeger Mixers, Pumps, Hoists, Paving Equip.
Jones Saw Benches
Kiesler Clamshell Buckets
Kohler Lighting Plants
Littleford Wheeled Rollers
McKiernan-Terry Pile Hammers
Marion Shovels, Cranes, Draglines
Nelson Bucket Loaders
Ohio Locomotive Cranes
Page Dragline Buckets
Porta Conveyors
Ramsey Winches
Rogers Bros. Trailers
Schramm Air Compressors
Symons Cone Crusher, Vibrating Screens
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Toledo Torches
Wiard Plows
Winslow Scales
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HANSON CLUTCH & MACHY. CO.—Full Revolving Shovels, Cranes, Draglines, ⅜, ½, ⅝, and ¾-yd.
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MINN. STL. & MACHY. CO.—Twin City Engines, parts
NORTHERN CONVEYOR CO.—Stationary & Portable Conveyor Units
O. K. CLUTCH & MACHY. CO.—Hoists & Compressors
SNOW REMOVAL EQ. CO.—Bateblade & Sierra Snow Plows
EARL WALKER CO. INC—Rd. Oilers, Walker Bars
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HARRON, RICKARD & McCONE COMPANY
2070 Bryant St., San Francisco
3850 Santa Fe Ave., Los Angeles
Representing
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Esco—Dippers, Dragline Buckets, etc.
Essick—Plaster Mixers, Rollers, Hoists
Gorman-Rupp—Pumps
Insley—Excavators
C. S. Johnson—Bins and Batchers
Koehring—Shovels, Mixers, Pavers, Dumptors
Kwik-Mix—Mixers
*Littleford — Bituminous Equipment
Mall—Vibrators
National Lead—Cinch Anchor Specialties
Parsons—Trenchers
Paxson—Bearcat Saw Tables
Pioneer—Gravel Equipment
Sterling—Wheelbarrows
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Wisconsin Motor Co.
Yale & Towne Mfg. Co.
Yates-American Machine Co.

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De Walt Products Corp.—Wood Working Machines
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Lansing Co.—Wheelbarrows, Concrete Carts
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Killefer Rippers, Harrows, Drag Scrapers, Plows
Kinney Asphalt Distributors
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Red Star Wheelbarrows, Concrete Carts
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Gallion—Rd. Machy., Graders, Motor Patrols, Rollers, Sand, Chip Spreaders, Sheepsfoot Rollers
Kohler—Generators, Lighting Plants
Le Roi—Air Compressors
Lesche—Hercules Red Strand Wire Rope
Michigan Power Shovel—Truck Cranes, Truck Shovels
P. & H.—Crawler Shovels, Crawler Cranes
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Cletrac—Tractors
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OWEN Buckets
SMITH Mixers
TRACKSON Traxcavators, Pipe Layers
WILLAMETTE HYSTER CO.

Warehouse Stock—Service Station

Member: Associated Equipment Distributors

UNITED HOISTING CO., INC.

165 Locust Avenue

NEW YORK, N.Y.

Representing

Concrete Equipment Manufacturers—Concrete Vibrators
Construction Machy. Co.—Concrete, Plaster & Mortar Mixers, Saw Rigs, Pumps, Hoists and Pneumatic Tired Concrete Carts
Independent Pneumatic Tool Co.—"Thor" Pneumatic Tools, Hand Saws, and Sump Pumps
Sterling Mfg. Co.—Wheelbarrows & Concrete Carts
Sullivan Machy. Co.—Compressors, Pneumatic Tools and Accessories

Member: Associated Equipment Distributors

THE SYRACUSE SUPPLY CO.

294 Ainsley Dr. **Syracuse, N.Y.**

CONSTRUCTION EQUIPMENT DIVISION

Syracuse—Rochester—Buffalo

Athey Truss Wheel Co.
Bethlehem Wire Rope
Caterpillar Tractor Co.
D-A Lubricant Co., Inc.
Gardner-Denver Co.
Goodyear Tire & Rubber Co.
Gravely Motor Plow & Cultivator Co.
Hauck Heaters
Highway Equipment Co.
Iowa Mfg. Co.
Jaeger Machine Co.
Killefer Mfg. Co.
LaCrosse Trailer & Equipment Co.
LaPlant-Choate Mfg. Co.
R. G. LeTourneau, Inc.
Link-Belt Speeder Corp.
Master Vibrator Co.
N. P. Nelson Iron Wks., Inc.
Timken Roller Bearing Service & Sales Co.—Timken Bits & Rods
Trackson Co.
Universal Form Clamp Co.
Willamette Hyster Co.

Member: Associated Equipment Distributors

T. L. PITTS AND SON

Charlotte, North Carolina

Representing

American Chain Link Fence—Wire Fencing
Barnes—Centrifugal, Diaphragm Pumps
Dorsey Brothers—Highway Trailers
Deister Machine—Vibrating Screens
Essco—Electric Signal Equipment
Fate-Root-Heath—Highway Tractor Mowers
Marvel—Conc. Vibrators, Heating Kettles
Mine & Smelter Supply—Rock Bit Grinders
Shunk—Road Machines, Drag Blades
T. L. Smith—Concrete Mixers
Universal Road Machinery—Rock Crusher Equipment
Universal Power—Arc Welders, Accessories
Universal Motor—Light, Power Plants
Western Cataphote—Street, Highway Signs

NORTH CAROLINA EQ. CO.

Raleigh **Statesville**

Aeroil Burner Company
American Cable Division
Barco Mfg. Co.
Buckeye Traction Ditcher Co.
Bucyrus-Erie Tractor Eq.
Cleaver-Brooks Company
Electric Tamper & Eq. Co.
Elgin Corporation
Euclid Road Machy. Co.
Fairbanks, Morse & Co.
Fairfield Engrg. Co.
Four Wh. Dr. Auto Co.
Frank G. Hough Co.
Galion Allsteel Body Co.
Galion Iron Wks. & Mfg.
Murphy Diesel Co.
Good Roads Machy. Corp.
Heltzel Steel Form & Iron Company
Highway Trailer Co.
Ingersoll-Rand Company
Internat'l Harvester Co.
Iowa Manufacturing Co.
Jaeger Machine Company
Jeffrey Manufacturing Co.
Jos. F. Kiesler Company
Kensington Steel Company
Northwest Engineering Co.
Page Engineering Company
Rogers Bros. Corp.
Rosco Mfg. Co.
The C. S. Johnson Co.
Wellman Engineering Co.

Member: Associated Equipment Distributors

CAROLINA TRACTOR & EQUIPMENT COMPANY

S. Main Ext. **Salisbury, N. Car.**

Branch Office and Warehouse: Raleigh, N. C.

ATHEY Track-wheel Wagons
BARBER-GREENE Loaders, Asphalt Plants, Finishers
BLAW-KNOX Steel Forms, Bins, Buckets, Trukmixers
CATERPILLAR Tractors, Graders, Power Units
C.M.C. Mixers, Pumps, Hoists
ETNYRE Bituminous Distributors, Flushers.
HUBER Rollers
JAHN Machinery Trailers
LaPLANT-CHOATE Wagons, Bulldozers
LeTOURNEAU Carry-all Scrapers
SLUSSER-McLEAN Wheelers, Rippers, Frames
SULLIVAN Air Compressors, Drills
THEW Shovels, Cranes
TRACKSON "Traxcavators"
UNIVERSAL Crushing Equipment

Member: Associated Equipment Distributors

THE CLETRAC OHIO SALES CO.

E. 193rd Street and Euclid Ave.
Cleveland **Ohio**

Representing

THE BAKER MFG. CO.—Power Scrapers
BUCKEYE TRACTION DITCHER CO.—Trailbuilders, Bulldozers
CENTAUR CO.—Highway Mowers
THE CLEVELAND TRACTOR CO.—Crawler Tractors, Front End Loaders
THE HEIL CO.—Power Scrapers, Bulldozers & Trailbuilders
THE ISAACSON IRON WORKS—Power Scrapers, Trailbuilders
MAIN STEEL, INC.—Snow Plows, Overhead Shovels
MEAD MORRISON—Winches
ROC COMPANY—Winches

W. T. WALSH EQUIPMENT CO.

3088 West 106th St., Cleveland, Ohio Tel. ORchard 4400

Allis-Chalmers—Tractors
Anthony—Dump Bodies
Atlas—Conveyors
Baker Mfg. Co.—Bulldozers
Brooks—Load Luggers
Buckeye—Ditchers
Bucyrus-Erie—Shovels, Cranes, Draglines
Buda—Gas & Diesel Power Units, Generator Sets
Caine—Corrugated Sheet Piling
Cleveland—Formgraders
Cleveland Rock Drill Co.—Air Tools
Complete—Wellpoint Systems
Construction Machy. Co.—Mixers
Hough—Tractor Front End Loaders
Jackson—Vibrators
LaCrosse—Trailers
LeRoi—Air Compressors, Engines
McKiernan-Terry Corp.—Pile Hammers
Michigan—Truck Shovels
Murphy-Diesel—Power Units, Generator Sets
Nelson—Bucket Loaders
Nove Engine Co.—Engines, Light Plants, Pumps
R-B Equipment Co.—Finegraders
Rosco Mfg. Co.—Distributors & Oilers
Timken—Bits
Wellman Engineering Co.—"Williams" Buckets
Gar Wood—Continental—Scrapers
Wm. Bros. Mfg. Co.—Tamping Rollers
Winslow—Scales

Member: Associated Equipment Distributors

SOUTHERN OHIO EQUIP. CO.

445 Woodlawn Ave., Zanesville, Ohio

Phone 1287

Distributors for

Allis-Chalmers Mfg. Co.
Austin Powder Co.
Baker Mfg. Co.
Bethlehem Steel Co.
Byers Machine Co.
Cleveland Rock Drill Co.
D-A Lubricant Co.
General Conveyor Co.
F. G. Hough Co.
Iowa Mfg. Co.
Paris Mfg. Co., Inc.
Schramm, Inc.
Shunk Mfg. Co.
Slusser-McLean Co.
Timken Roller Bearing Co.
Gar Wood Industries, Inc.

Member: Associated Equipment Distributors

LOOK THIS DIRECTORY OVER CAREFULLY

If you find any errors while checking over this directory will you please advise us, because it is our desire to keep it accurate and up to date at all times.

CONTRACTORS AND ENGINEERS MONTHLY

470 Fourth Avenue **New York**

CLYDE EQUIPMENT CO.

Portland, Ore. **Seattle, Wash.**

Advance Car Mover Co.
Air-Way Pumps & Equip. Co.
Atlas Imperial Diesel Eng. Co.
Barnes Mfg. Co.
Beebe Bros.
Bucyrus-Erie Co.
Buda Company
Clyde Iron Works, Inc.
Coffing Hoist Co.
Concrete Surf. Machy. Co.
Dorco Corp.
Davenport Besler Corp.
Dixon Valve & Coupling Co.
Duff Norton Mfg. Co.
Geo. Haiss Mfg. Co., Inc.
Handlan Inc.
C. S. Johnson Co.
Klauer Mfg. Co.
Kohler Co.
LeRoi Company
A. Leschen & Sons Rope Co.
The Linde Air Products Co.
Marvel Equipment Co.
M. P. McCaffrey, Inc.
Alexander Milburn Co.
Oshkosh Motor Tr. Mfg. Co.
Orton Crane & Shovel Co.
Owen Bucket Co.
Ramsey Machy. Co.
Red Star Products Inc.
Sidgon Derrick Co.
Sauerman Brothers, Inc.
Skookum Co.
T. L. Smith Co.
Smith Engineering Works
Smith Welding Equip. Co.
Sterling Wheelbarrow Co.
Sullivan Machinery Co.
Templeton Kenly & Co., Inc.
Toledo Pressed Steel Co.
Union Fork & Hoe Co.
Van Dorn Iron Works Co.
Vulcan Iron Works
Wiley Machine Co., Inc.
Worthington Mower Co.

Member: Associated Equipment Distributors

LOGGERS & CONTRACTORS MACHINERY COMPANY

240 S.E. Clay St. **Portland, Ore.**

Representing

Archer Iron Works
Broderick & Bascom Rope Co.
Buckeye Traction Ditcher Co.
Butler Bin Co.
Chain Belt Co.
Diamond Iron Works
Euclid Road Machy. Co.
Garlinghouse Bros.
W. E. Grace Mfg. Co.
Harnischfeger Corp.
Hercules Motors Corp.
Ingersoll-Rand Co.
J. E. Ingram Equip. Co.
Kay-Brunner Steel Products Inc.
Metal Forms Corp.
Plymouth Locomotive Works
Ramsey Machy. Co.—Hoists
Vapor Blast Mfg. Co.
Woolridge Mfg. Co.

Member: Associated Equipment Distributors

A. R. AMOS, Jr.

713 Commercial Trust Bldg., Philadelphia, Pa.

Representing

Abbe Engineering Co.
Barber-Greene Co.
Beach-Russ Co.
Lecourtenay Co.
Sauerman Bros. Co.
Smith Engineering Works
Whitcomb Locomotive Co.
Yeomans Brothers Co.

COMLEY EQUIPMENT CO.

863 No. 28th St., Philadelphia

Representing

BROWNING CRANE & SHOVEL CO.—Rail and Wagon Cranes
MARLOW PUMPS—Centrifugal and Diaphragm Pumps
OWEN BUCKET CO.—Clamshell Buckets, Grapples
McCAFFREY-RUDDOCK CORP.—Rud-O-Matic Taglines.

Service and Parts

With facilities for complete repair jobs

EDELEN & BOYER COMPANY

Office and Warehouse **Philadelphia**
236 North 23rd St. **Penna.**

Distributors of

Adnun Stone Spreaders
Adnun Black Top Pavers
Aeroil Heaters, Melting Pots
Archer Towers, Buckets
Buckeye—Shovels, Cranes, Ditchers, Spreaders
CMC Master Mixers, Saw Rigs
CMC Self-Priming Pumps
Dempster—Dumpsters
Flex-Plane Finishing Machine
Hayward Clamshell Buckets
Heltzel Finishing Mach.
Heltzel Steel Forms, Bins
Jackson Wheelbarrows, etc.
LaCrosse Tu-Way Trailers
Lidgerwood Hoists
Marsh-Capron Mixers
Miles Block Machines
Multi Foote Pavers
New Haven Burlapped-Cotton Blankets
Pulsometer Steam Pumps
R-B Finegrader
Sasgen Derricks, etc.
Sullivan Portable Air Comp.
Tru-Lay Steel Cable
Union Pile Hammers
White Vibrators
Wonder Concrete Mixers

GILES & RANSOME

17th St. & Sedgley Ave., Philadelphia

Athey Truss Wheel Co.—Crawler Wagons
Barnes Mfg. Co.—Centrifugal Diaphragm and Force Pumps
Blaw-Knox Co.—Clamshell Buckets, Road Forms, Material and Cement Bins
"Caterpillar"—Tractors and Road Machinery
R. G. LeTourneau, Inc.—Carryalls, Buggies
LaPlant-Choate Mfg. Co. — Bulldozers, Trailbuilders, Carryalls, etc.
Master—Elec., Gas. Concrete Vibrators
Northwest Engineering Co.—Gasoline Cranes, Shovels and Draglines
Ord—Road Finishing Machine
Ransome Concrete Machinery Co.—Concrete Mixers and Appliances

Member: Associated Equipment Distributors

HOWARD W. READ CORP.

N. W. Cor. 25th and Wharton Sts., Philadelphia, Pa.

Distributors

Ralph B. Carter Co.
Insley Mfg. Co.
Koehring Co.
Quick-Way Truck Shovel Mfg. Co.
Vulcan Iron Works, Inc.—Pile Hammers

Also Carry in Stock:

Hoisting Engines, Gas and Steam

Member: Associated Equipment Distributors

SERVICE SUPPLY CORPORATION

20th and Venango Sts., Philadelphia, Pa.

Representing

Bay City Shovels, Inc.—Shovels, Cranes, etc.
Beach Mfg. Co.—Saw Rigs
LeRoi Co.—Compressors, Power Units, Generators
Independent Pneumatic Tool Co.—Air Tools
W. F. Hebard & Co.—Shop Mules
Hercules Company—Road Rollers
Internat'l Harvester Co.—Indus. Wheeltype and Crawler Tractors
Jaeger Machine Co.—Mixers, Truck Mixers, Pumps, Black Top Pavers, Finishing Machines
C. S. Johnson & Co.—Rims, Batchers, Cement Handl. Eq.
Lambert-National—Hoists
Littleford Bros.—Road Oil Distrs. Heating Kettles, etc.
McKiernan-Terry Corp.—Pile Hammers
N. P. Nelson Iron Wks., Inc.—Loaders & Belt Conveyors
The Parsons Company—Trench Machines, Snow Plows
Pioneer Engineering Wks., Inc.—Roll Crushers
Silent Hoist Winch & Crane Co.—Krane Kars. Winches, Capstans, Car Pullers, etc.

Member: **Associated Equipment Distributors**

J. JACOB SHANNON & CO.

1744—Sedgley Avenue—1744

PHILADELPHIA

Representing

Burch Corp.—Snow Plows, Maintainers
C. H. & E. Mfg. Co.—Saw Rigs, Rollers, Hoists
Clyde Iron Wks., Inc.—Gas. Elec., Steam Hoists
Concrete Surfacing Machinery Co.—Berg Surfacers
Electric Tamper & Equipment Co.—"Jackson" Vibrators
Eirich Mashy. Co.—Plaster Mixers
Gardner-Denver Co.—Air Compressors
Gilson Brothers Co.—Conc. Mixers
Huber Mfg. Co.—Road Rollers
Jay Mfg. Co.—Snow Loaders
Link-Belt Speed-o-Matic Shovels, Cranes, Draglines
Richmond Screw Anchor Co.—Form ties
W. A. Riddell Corp.—Road Graders
John A. Roebling's Sons Co.—Wire Rope, Fittings
Sasgen Derrick Co.—Derricks and Winches
Shannon—Derricks and Derrick Fittings
Sterling Mashy. Corp.—Dumps, Hoists, Generators
Van Dorn Iron Works Co.—Sweepers

Member: **Associated Equipment Distributors**

NIXON-HASSELLE COMPANY, INC.

Contractors' Equipment

Chattanooga Tennessee

Representing

Archer Towers, Spouting Equipment
Austin-Western Graders, Crushers, Rollers, Scrapers, etc.
Blaw-Knox Batchers, Buckets, Forms, etc.
Bros Tank Car Heaters, etc.
Bucyrus-Erie Bullgraders, Scrapers, etc.
Four Wheel Drive Trucks
Haiss Loaders, Conveyors, etc.
Hough Road Sweepers, Sprinklers, etc.
Murphy Diesel Engines
Ingersoll-Rand Compressors, Jackhammers, Air Tools, etc.
International TracTracTors, Wheel Tractors & Power Units
Jahn Machinery Trailers
Lidgerwood Hoists, etc.
Macleod Asphalt Kettles
Mall Vibrating Equipment, Saws, etc.
Newport Culvert Pipe
Northwest Cranes, Shovels
Rex Mixers, Pavers, Pumps, etc.
Sasgen Derricks, etc.
Timken Detachable Bits
Vulcan Gas Locomotives

Member: **Associated Equipment Distributors**

BROOKS EQUIP. & MFG. CO.

Knoxville 408 Davenport Rd. Tennessee

Representing

J. D. Adams Co.
Buckeye Traction Ditcher Co.
Bucyrus-Erie Co.
Buda Co.
Cleveland Rock Drill Co.
Columbus Conveyor Co.
Construction Machy. Corp.
Davey Compressor Co.
Electric Tamper & Equip. Co.
Euclid Road Machy. Co.
Geo. Haiss Mfg. Co.
Heltzel Steel Form & Iron Co.
Hercules Co.
Hew Accessories Co.
Frank G. Hough Co.
Hughes-Keenan Co.
International Harvester Co.
Linn Mfg. Corp.
Manhattan Rubber Mfg. Div.
Municipal Supply Co.
N. P. Nelson Iron Wks.
Pioneer Engrg. Wks., Inc.
Rosco Mfg. Co.
Sasgen Derrick Co.
Silent Hoist Winch & Crane Co.
Tulsa Winch Co.
Union Wire Rope Co.

Member: **Associated Equipment Distributors**

OSBORNE EQUIPMENT COMPANY

525 State Street, Knoxville, Tennessee

Distributors for

American Cable Div., American Chain & Cable Co.
Ariens Co.
Boston Woven Hose & Rubber Co.
Buckeye Traction Ditcher Co.
J. I. Case Co. (Industrial)
Cleveland Tractor Co.
Davenport Besler Corp.
DeSoto Foundry Inc.
Gallion Iron Wks. & Mfg. Co.
Gardner-Denver Co.
Hall Co.
Hobart Bros. Co.
Hug Co.
Iowa Mfg. Co.
Jaeger Machine Co.
Jeffrey Mfg. Co.
C. S. Johnson Co.
Kato Engineering Co.
Murphy-Diesel Co.
Northwest Engrg. Co.
Owen Bucket Co.
Pomona Pump Co.
Sasgen Derrick Co.
Silent Hoist Winch & Crane Co.
Skilsaw, Inc.
T. L. Smith Co., (Tilting Mixers)
Standard Steel Works
Toledo Pressed Steel Co.

Member: **Associated Equipment Distributors**

ROAD BUILDERS EQUIPMENT CO.

Third & Calhoun, Memphis, Tenn.

Representing

J. D. Adams Co.
Bean Co. (earth drills only)
Bucyrus-Erie Co.
Burch Corp.
Construction Machinery Co.
Hercules Co.
W. F. Hebard Co.
Frank G. Hough Co.
International Harvester Co.
Standard Steel Works
Union Wire Rope Corp.
Wellman Engineering Co.

Member: **Associated Equipment Distributors**

WILSON-WEESNER-WILKINSON CO.

Nashville Tennessee

Representing

Allis-Chalmers Mfg. Co.
Ames Baldwin Wyoming Co.
Baker Mfg. Co.
Barber Greene Co.
Blaw-Knox Co.
Clayer-Brooks Co.
Clyde Iron Works, Inc.
E. D. Etnyre Co., Inc.
Gorman-Rupp Co.
Ingersoll-Rand Co.
Insley Mfg. Co.
Koehring Co.
Littleford Bros.
Master Vibrator Co.
The Parsons Co.
Smith Engineering Works
Gar Wood Indus., Inc.

NASHVILLE—KNOXVILLE

Warehouse Stocks of Service

Reinforcing Steel and Mesh

Member: **Associated Equipment Distributors**

BROWNING-FERRIS MACHY. CO.

205 Exposition Ave. Dallas, Texas

Texas at Rice Sts. Houston, Texas

Representing

Cleveland Trencher Co.
Foote Company—Pavers
Galion Iron Works & Mfg. Co.
Bucyrus-Erie—Scrapers, Bulldozers
Ingersoll-Rand Company
International—Tractors
Iowa Mfg. Co.—Cedar Rapids Line
Jaeger Machine Company
Jones Superior Mach. Co.
Littleford Brothers
The Owen Bucket Company
Page Engineering Co.
Sterling Wheelbarrow Co.
Thew Shovel Company
Trackson Company

Member: **Associated Equipment Distributors**

R. B. EVERETT & CO.

3112-18 Harrisburg Blvd. Houston, Texas

BLAW-KNOX Road Plant Equipment, Bins, Clamshell Buckets
AMERICAN Hoisting Machinery
"P. & H." Gasoline Cranes
McKIERNAN-TERRY Pile Hammers, etc.
CONNERY Asphalt Equip.
CHAIN BELT Concrete Mixers, Saw Rigs, Pavers
NOVO Engines, Hoists, Pumps
"RED STAR" Wheelbarrows
SAUERMAN Cableways
BATES Wire Ties
PULSOMETER & NYE Steam Pumps
PATENT Safety Swinging Scaffolding
TRU-LAY Wire Rope
BUFFALO-SPRINGFIELD Road Builders
BULLIVAN Compressors
PORTABLE Conveyors
ETNYRE Asphalt Distrs.
FLYNN Surgrader
PAGE Dragline Buckets
MALL Vibrators

Member: **Associated Equipment Distributors**

J. E. INGRAM EQUIP. CO.

1146 West Laurel St. San Antonio, Texas

Representing

Barber-Greene Co.
Buckeye Traction Ditcher Co.
Buda Co.
Chain Belt Co.
DeSoto Foundry Co.
Durex Mfg. Co.
Etnyre & Co., E. D.
Ingram Rollers
Mall Tool Co.
Murphy-Diesel Co.
Northwest Engrg. Co.
Owen Bucket Co.
Simplicity Engrg. Co.
Sullivan Machy. Co.
Whiteman Mfg. Co.

Member: **Associated Equipment Distributors**

A. L. GUILLE

825 Wainwright Bldg., Norfolk, Va.

Representing

Barber-Greene Co.—Conveyors, Loaders, Ditchers, Blacktop Mixers, Finishers

Heltzel Steel Form & Iron Co.—Steel Rd. Forms, Curb & Gutter Forms, Aggregate Bins, Bulk Cement Bins, etc.

Flexible Road Joint Machine Co.—Concrete Flexplane Finishers, Joint Machines

Fate-Root-Heath Co.—Plymouth line of Internal Combustion and Diesel Electric Locomotives

Member: **Associated Equipment Distributors**

HIGHWAY MACHINERY AND SUPPLY CO., INC.

1724 Altamont Ave. Richmond, Va.

Representing

Aeroil Burner Co., Inc.
Austin-Western Road Machy. Co.
Buckeye Traction Ditcher Co. (Tractor Equip.)
Burch Corp.
C. H. & E. Mfg. Co.
Chicago Automatic Conveyor Co.
Cleveland Formgrader Co.
Cleveland Tractor Co.
DeSoto Foundry Co.
W. E. Grace Mfg. Co.
Gray Co.
Heil Co.
Independent Pneumatic Tool Co.
A. Leschen & Sons Rope Co.
Murphy Diesel Co.
Northwest Engrg. Co.
Owen Bucket Co.
Ransome Machy. Co.
White Mfg. Co.
Worthington Pump & Machy. Corp.

Member: **Associated Equipment Distributors**

PHILLIPS MACHINERY CO.

900 East Cary St. Richmond, Va.

Representing

Aeroil Burner Co., Inc.
Austin Machinery Corp.
Broderick & Bascom Rope Co.
Butler Bin Co.
Chain Belt Co.
Cleveland Trencher Co.
Clyde Iron Wks., Inc.
Concrete Surf. Machy. Co.
Independent Pneu. Tool Co.
Jackson Mfg. Co.
Jones Superior Mach. Co.
Manitowoc Engineering Wks.
Master Vibrator Co.
Owen Bucket Co.
Page Engineering Co.
Rogers Brothers Corp.
Sasgen Derrick Co.
Sauerman Brothers, Inc.
Skilsaw, Inc.
Vulcan Iron Works
Walker-Turner Co.

Member: **Associated Equipment Distributors**

STAR MACHINERY CO.

1741 First Ave., South Seattle, Wash.

Representing

Advance Machine Co.
Air Reduction Sales Co.
American Hoist & Derrick Co.
American-Marsh Pumps, Inc.
Heebe Brothers, Inc.
Chain Belt Co.
C. H. & E. Mfg. Co.
DeVilbiss Co.
DeWalt Products Corp.
Garlinghouse Bros.
Gordon Smith, Inc.
Hercules Motors Corp.
Independent Pneu. Tool Co.
Master Vibrator Co.
Oster Mfg. Co.
Red Star Mfg. Co.
Reed-Prentice Corp.
John A. Roebling's Sons Co.
Whiteman Mfg. Co.
Wellman Engrg. Co.
Wisconsin Motor Corp.
Witte Engine Corp.
Worthington Pump & Machy. Corp.

Member: **Associated Equipment Distributors**

CONSTRUCTION EQUIPMENT CO.

1118-1124 Ide Ave., Spokane, Wash.

Aeroil Burner Co., Inc.
Archer Iron Works
Bates Wire Ties
Beebe Bros.
Blystone Mfg. Co.
Broderick & Bascom Rope
Bucyrus-Erie Co.
Buffalo-Springfd. Roller Co.
Butler Bin Co.
Chain Belt Co.
Climax Eng. Co.
Concrete Surf. Machy. Co.
D-A Lubricant Co.
Detroit Graphite Co.
R. E. Dietz Co.
Duff-Norton Mfg. Co.
Fairbanks, Morse & Co.
Fate-Root-Heath Co.
Homestead Valve Mfg. Co.
Kalamazoo Ry. Supply Co.
LeRoi Co.
The Linde Air Products Co.
M. & M. Wire Clamp Co.
Mall Tool Co.
Niagara Mfg. Co.
Red Star Products Co.
Sasgen Derrick Co.
Sheldon Mfg. Co.
Sterling Machinery Corp.
Sterling Wheelbarrow Co.
Sullivan Machinery Co.
Sunbeam Mfg. Co.
Templeton, Kenly & Co.
Willamette Hyster Co.
"Williams" Buckets, etc.
Young Iron Works

Member: **Associated Equipment Distributors**

ALAMO IRON WORKS

San Antonio Texas

Koehring shovels, cranes, mixers, pavers, dumptors, etc.
Insley shovels, cranes, wagons, concr. buckets, etc.
Kwik-Mix mixers
Parsons ditchers, backfillers
Gardner-Denver compressors, paving breakers, drills
Telsmith quarry plant, sand and gravel plant equipment.
Orr & Sembower hoists, boilers
Haiss loaders, conveyors
Johnson batchers, bins, bulk cement plants
Ther pneumatic tools
Red Star wheelbarrows, multiplex saws
C.H. & E. saw rigs
German-Rupp pumps
Timken rock bits
Black & Decker electric drills, hammers, portable electric saws
Bethlehem wire rope
Cleaver Brooks tank car heaters, boosters
Onan generating plants
Master vibrators, generators
Williams clamshell buckets
Page dragline buckets
Hendrix dragline buckets
Delta woodworking machinery
Universal form clamps
Macleod asphalt heaters
Sidney woodworking machinery
Hotchkiss steel road forms
Wood shovels, scoops

Member: **Associated Equipment Distributors**

NAGLE-HART TRACTOR & EQUIPMENT CO.

Eau Claire Madison Milwaukee

Wisconsin

Representing

ATHEY MobiLoaders, Trailers, Cranes
CATERPILLAR Tractors, Motor Graders, Diesel Engines, Marine Engines, Electric Sets
D-A LUBRICANT Oil and Grease
DAVENPORT BESLER-FRINK Snow Plows
DIAMOND Rock, Sand, Gravel Crushing; Screening, Washing Equipment
ETNYRE Asphalt Distributors
HUBER Rollers
LaPLANT CHOATE Bulldozers, Trailbuilders, Snow Plows, Scrapers
LeTOURNEAU Scrapers, Tournapulls, Bulldozers, Angledozers, Hoosiers, Cranes, Sheepsfoot Rollers
LESCHEN Wire Rope
MacWHYTE Wire Rope
MARTIN Trailers
TRACKSON Tractavators, Pipelayers
UNIVERSAL Light Plants
WILLAMETTE HYSTER Winches, Hoists, Cranes, Logging Equipment

Member: **Associated Equipment Distributors**

BOEHCK EQUIPMENT CO.

2404 W. Clybourn St. Milwaukee, Wis.

Representing

American Hoist & Derrick Co.
Byers Machine Co.
Caine Steel Co.
Centaur Co.
Concrete Surfacing Machy. Co.
Electric Tam. & Equip. Co.
Hauck Mfg. Company
Hercules St. Products Co.
Iowa Manufacturing Co.
Independent Pneumatic Tool Co.
Jaeger Machine Co.
C. S. Johnson Company
Jones-Superior Machine Co.
LeRoi Co.
A. Leschen & Sons Rope Co.
Lima Locomotive Works
McKiernan-Terry Corp.
N. P. Nelson Iron Wks., Inc.
Portable Machinery Company
Red Star Products, Inc.
Rogers Bros. Corp.
Sasgen Derrick Co.
Superior Concrete Accessories, Inc.
Union Fork & Hoe Co.
Walker-Turner Co., Inc.
Wellman Engineering Co.

Member: **Associated Equipment Distributors**

CUNNINGHAM-ORTMAYER CO.

429 W. Michigan St. Milwaukee, Wis.

Butler Bins, Batchers
Case Tractors and Mowers
Cleveland Formgrader Paving Equipment
Coffing Hoists
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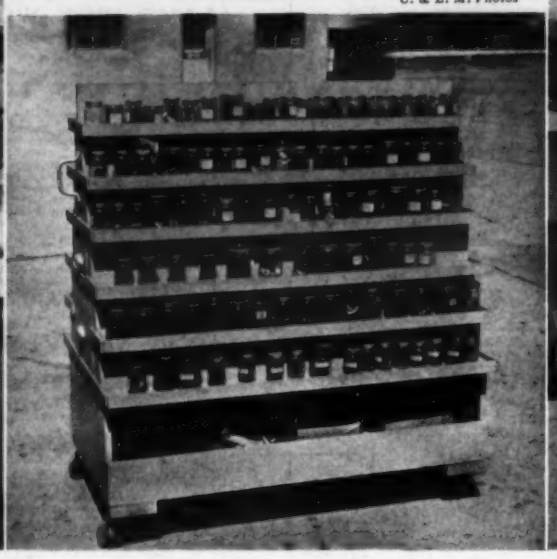
INDEX TO ADVERTISING

Aeroil Burner Co., Inc. 15
Agerstrand Corp. 31
Allied Steel Products, Inc. 10
American Cable Division 16
American Steel Scraper Co. 58
Ariens Co. 56
Athey Truss Wheel Co. 45
Baker Mfg. Co. 19
Barber-Greene Co. 12
Beebe Bros. 24
Bethlehem Steel Co. 28
Blackhawk Mfg. Co. 53
Blaw-Knox Division 23
Briggs & Stratton Corp. 43
Buckeye Traction Ditcher Co. 47
Bucyrus-Erie Co. 24
Burch Corp. 28
Carey Co., Philip, The 45
Carver Pump Co. 22
Caterpillar Tractor Co. 5
C. H. & E. Mfg. Co. 43
Chevrolet Division of General Motors 31
Chicago Pneumatic Tool Co. 18
Cleveland Rock Drill Co., The 46
Cleveland Tractor Co. 35
Complete Machy. & Equip. Co., Inc. 49
Concrete Chemical Co. 19
Connery Construction Co. 47
D-A Lubricant Co., Inc. 14
Davenport Besler Corp. 24
DeSoto Foundry, Inc. 54
Dixon Valve & Coupling Co. 58
Electric Tamper & Equip. Co. 54
Electro-Motive Division, General Motors Sales Corp. 26
Embury Mfg. Co. 30
Flexible Road Joint Mach. Co. 58
Fulton Bag & Cotton Mills 34
Galion Iron Works & Mfg. Co. 59
Garlinghouse Bros. 49
Gar Wood Industries, Inc. 27
Gatke Corp. 13
Geerpres Wringer, Inc. 31
General Excavator Co. 51
Goodall Rubber Co., Inc. 59
Griffin Wellpoint Corp. 38
Haiss Mfg. Co., George 59
Hayward Co., The 39
Heil Co., The 11
Heltzel Steel Form & Iron Co. 41
Hetherington & Berner Inc. 18
Highway Steel Products Co. 53
Hi-way Service Corp. 9
Hobart Bros. 25
Howe-Simpson, Inc. 37
Huber Mfg. Co. 8
Industrial Brownhoist Corp. 60
International Harvester Co. 25
Iowa Mfg. Co. 44
Jaeger Machine Co., The 39
Jahn Co., C. R. 39
Koehring Co. 14
Kron Company 56
Laclede Steel Co. 52
LaCrosse Trailer & Equip. Co. 29
LeTourneau, Inc., R. G. 15
Lidgerwood Mfg. Co. 55
Lincoln Hotel 60
Linn Mfg. Co. 54
Littleford Bros. 30
Macmillan Petroleum Corp. 21
Madsen Iron Works 55
Mall Tool Co. 55
Marion Steam Shovel Co. 42
Marlow Pumps 8
Martin Machine Co. 51
Marvel Equipment Mfrs. Inc. 16
McCaffrey-Ruddock Tagline Corp. 49
McKiernan-Terry Corp. 58
Michigan Power Shovel Co. 38
National Carbide Corp. 30
Novo Engine Co. 57
Onan & Sons, D. W. 12
Owen Bucket Co., The 56
Page Engineering Co. 53
Pettibone Mulliken Corp. 34
Reilly Tar & Chemical Co. 57
Richmond Screw Anchor Co. 22
Rodgers Hydraulic, Inc. 48
Rogers Bros. Corp. 46
Rototiller, Inc. 40
Sand's Level & Tool Co. 35
Sasgen Derrick Co. 36
Schramm Inc. 52
Seaman Motors 29
Servicised Products Corp. 43
Shell Oil Co., Inc. 17
Sinclair Refining Co., (Inc.) 10
Slope-Meter Co. 46
Standard Oil Co., Indiana 36
Stang Corp., John W. 35
Sterling Machinery Corp. 25
Sterling Wheelbarrow Co. 50
Stoody Co. 50
Syntron Co. 20
Templeton, Kenly & Co. 52
Texas Co., The (asphalt) 3
Texas Co., The (lubricants) 6, 7
Thew Shovel Co. 13
Toro Mfg. Corp. 37
Union Iron Works, Inc. 26
United Concrete Form Products Co. 40
Universal Power Corp. 9
Viber Co. 40
Vulcan Tool Mfg. Co. 27
Walter Motor Truck Co. 20
Warren-Knight Co. 42
Waukesha Motor Co. 37
Wellman Engineering Co., The 50
White Mfg. Co. 21

Contractors and Engineers Monthly



Scenes at the Phoenix shops of the Arizona State Highway Department where many ingenious devices and tools have been developed for use in the work of the department. Left, the reflector-button sign assembly stand—one of the welded products of the shop; below, a handy stand on casters with small parts in glass jars on the shelves, also home-made; right, the home-made air-raid siren atop the shops. See page 42.

C. & E. M. Photos

A bearded operator of a Caterpillar tractor bulldozes dirt fill into place on the new Alaska Road Commission Highway between Dry Creek and Anchorage. A network of roads is being built in Alaska to team up with the Alcan Highway, America's short cut to Tokyo.

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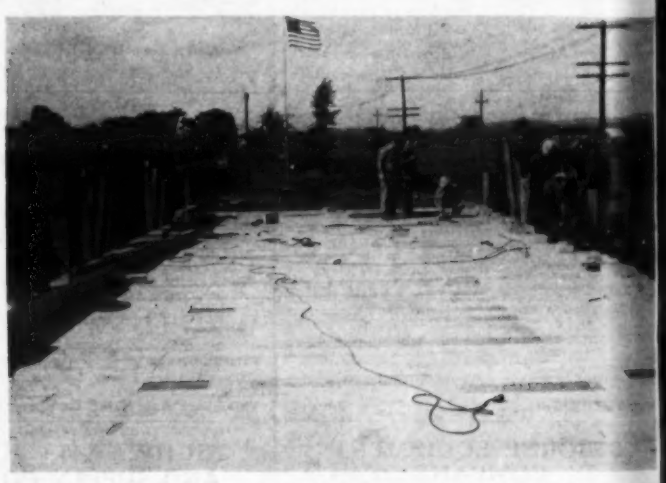

Completing the flooring on one of New Hampshire's timber bridges. To save critical materials and yet meet the need for reconstruction and strengthening of a number of bridges on the New Hampshire state highway system, timber superstructures have been used and been found both satisfactory and economical. See page 15.

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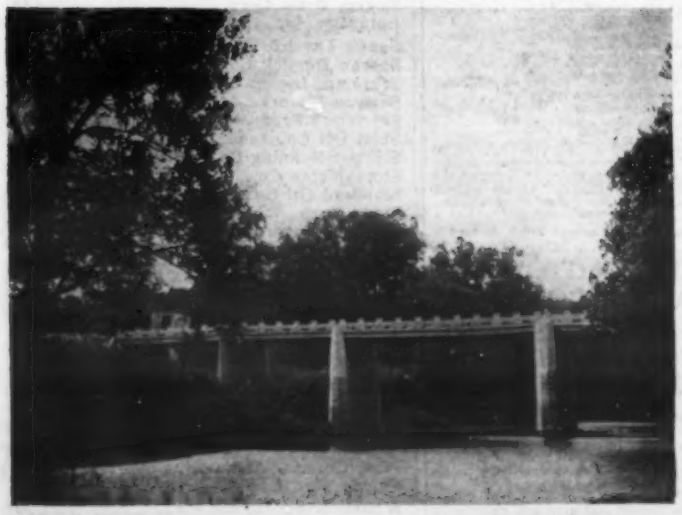

C. & E. M. Photo

The Moreau River Bridge, a 190-foot structure carrying a 22-foot roadway. This is the most ambitious structure built by Cole County, Mo., using the unit steel forms developed by F. E. Ross, County Engineer. See page 1.

The hot-mix plant which furnished the resurfacing material for modernizing the Beeline Highway in Alabama, shown in operation at a quarry located on U. S. 31. See page 10.